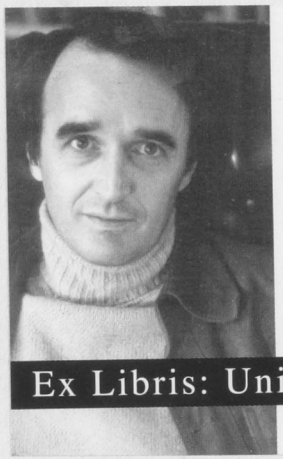
JUBILEE AUDITORIUMS

EDMONTON AND CALGARY, ALBERTA



JUBILEE AUDITORIUMS

EDMONTON AND CALGARY, ALBERTA

HE FOUND THE CITY BUILT OF BRICK -
LEFT IT BUILT OF MARBLE

SUETONIUS

MAY THIS STRUCTURE ENDURE AS A MONUMENT TO THE ALBERTA PIONEER · IN THESE STONES IS OUR TRIBUTE TO THOSE WHO FORMED OUR PROVINCE · DEDICATED IN THE YEAR 1955 - THE FIFTIETH YEAR OF THE PROVINCE OF ALBERTA ·

THIS INSCRIPTION APPEARS ON THE STONE CLAD WALL
AT THE ENTRANCE TO EACH OF THE AUDITORIUMS BUILT BY THE PROVINCE OF ALBERTA

PUBLIC BUILDINGS: THESE SHOULD BE SO CARRIED OUT

THAT ACCOUNT IS TAKEN OF STRENGTH, UTILITY, GRACE.

—*Vitruvius*

Contents

Foreword

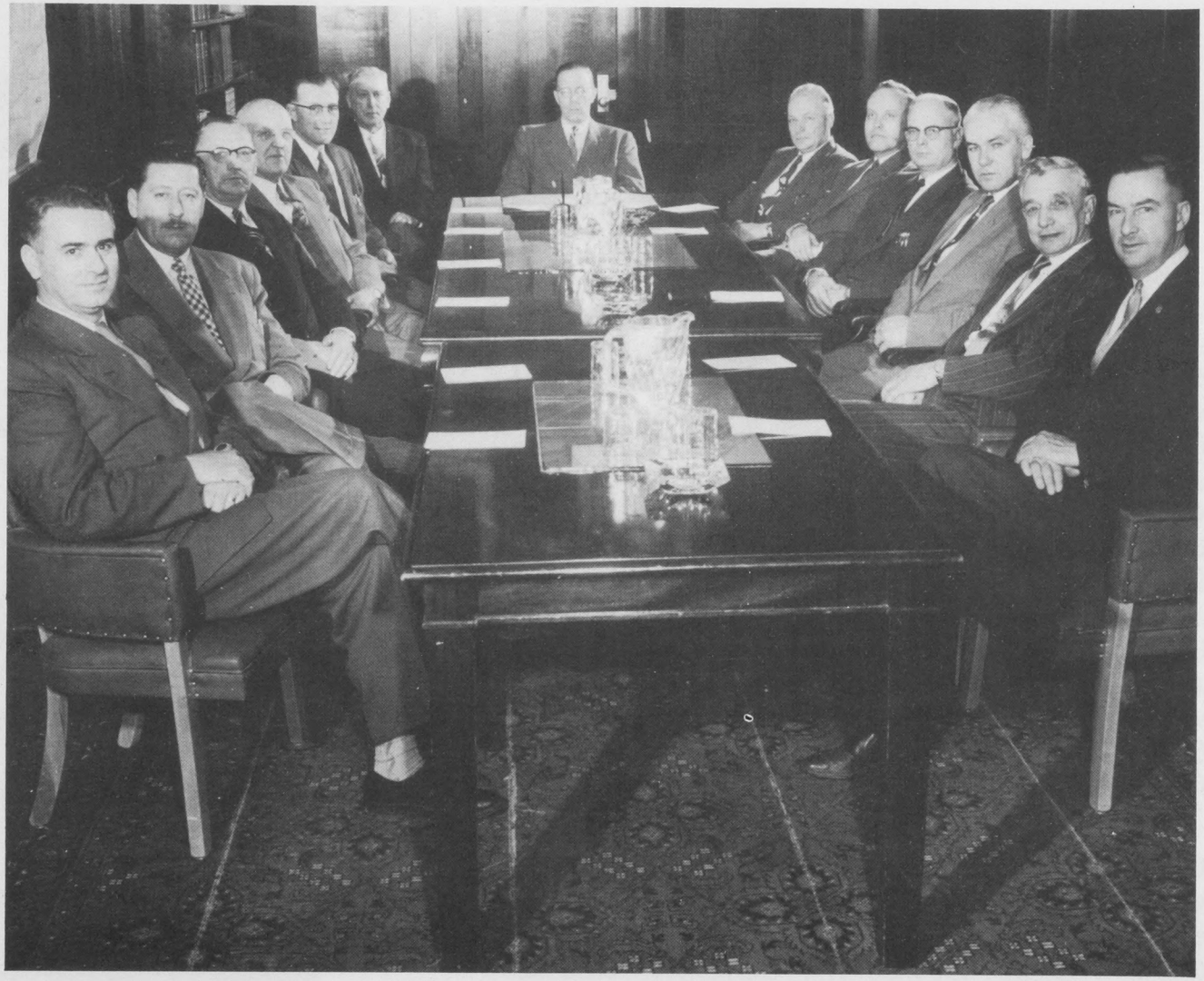
BY THE HONOURABLE E. C. MANNING
PREMIER,
PROVINCE OF ALBERTA

On the following pages, you will see depicted by word and picture the two auditoriums erected in the Province of Alberta, at Edmonton and at Calgary, to commemorate the Province's Golden Jubilee in 1955.

Gifts from the people of this Province and of this generation to Alberta citizens of future generations, these magnificent buildings are dedicated to the memory of those respected pioneers who blazed the original trails to this good land and who, with toil and courage and perseverance, laid the foundations on which successive generations have built the Alberta of today.

From this book you will see that in the design of these facilities no effort was spared to make them of use to every section of our modern complex society and for every phase of cultural activity. They were carefully planned for the enrichment of the lives of young and old alike — for the scholar, the teacher, businessman and farmer, artist and laborer. They are for the use of both rural and urban groups, for large assemblies or small. In these buildings our people will hear music, will watch ballet and drama, enjoy festivals and conventions, will see exhibits and participate in a wide variety of activities. For every constructive use for which such facilities can be utilized, they are here for that purpose for all to enjoy.

It is the sincere hope of the Alberta Government that these splendid buildings will be used to the greatest possible degree for the enjoyment and cultural advancement of all the present and future citizens of our Province.



MEMBERS OF THE CABINET WHO CONCEIVED AND APPROVED THE PLAN FOR THE AUDITORIUMS

Left to right: The Honourable A. R. Patrick, Minister of Economic Affairs; the Honourable F. C. Colborne, Minister without Portfolio; the Honourable L. C. Halmrast, Minister of Agriculture; the Honourable R. D. Jorgenson, Minister of Welfare; the Honourable R. Reierson, Minister of Industries and Labour; the Honourable Dr. W. W. Cross, Minister of Health; the Honourable E. C. Manning, Premier, Minister of Mines and Minerals and Attorney General; the Honourable A. J. Hooke, Minister of Municipal Affairs and Provincial Secretary; the Honourable A. O. Aalborg, Minister of Education; the Honourable E. W. Hinman, Provincial Treasurer; the Honourable N. A. Willmore, Minister of Lands and Forests; the Honourable J. Hartley, Minister of Public Works; The Honourable G. E. Taylor, Minister of Telephones and Highways.

THE HONOURABLE A. J. HOOKE

Minister of the Departments of Economic Affairs and of Public Works to August 1, 1955.

THE HONOURABLE J. HARTLEY

Minister of Public Works

The Department of Public Works

A. ARNOLD

Deputy Minister of Public Works

All phases of the planning, designing and construction of the two identical Jubilee Auditoriums were carried out by the Provincial Department of Public Works, employing the resources of the department's Architectural and Engineering Branches. Under the direction of Mr. A. Arnold, Deputy Minister of Public Works, the architectural design was prepared and co-ordinated with the structural, mechanical and electrical requirements, under the supervision of the department's Chief Architect, Mr. R. Clarke.

The Honourable A. J. Hooke, Minister of the Departments of Economic Affairs and of Public Works, until he assumed the joint offices of Minister of Municipal Affairs and Provincial Secretary in 1955, acted also as chairman of a three-member cabinet committee directing the project, and was actively associated with the work from its inception. Succeeding Mr. Hooke as Minister of Public Works in 1955, the Honourable J. Hartley then took over administration of specific policy matters in connection with the construction of the buildings.

History of the Design

During the first fifty years of Alberta's history as a province of Canada, the people of Alberta have been primarily concerned with the taming of the wilderness, the cultivation of the land, the building of towns and cities, and the development of industries to meet the immediate material needs of the population. Although the thread of desire for participation in the arts, in good drama and fine music, has always been woven into the pattern of the province's progress, development of an expressive cultural life has lagged. Nowhere in the province have there been suitable facilities for the proper presentation of opera, ballet, dramatic or symphonic performances, and even in the two largest cities, Edmonton and Calgary, dramatic and musical arts have, of necessity, been presented in wholly unsuitable and undignified surroundings. This lack of accommodation has, in turn, directly affected the growth of local musical and dramatic talents.

These, then, were the conditions which prompted the government of the Province of Alberta to propose the erection of two large auditoriums, one in Edmonton and one in Calgary, in commemoration of the province's fiftieth anniversary in 1955. The announcement of the decision was made by the Honourable E. C. Manning, Premier of Alberta, on May 4, 1954, and a three-member cabinet committee consisting of the Honourable A. J. Hooke, Minister of Economic Affairs and Minister of Public Works, the Honourable A. O. Aalborg,

Minister of Education, and the Honourable C. E. Gerhart, Provincial Treasurer and Provincial Secretary, were appointed to direct the planning of the buildings.

At the direction of this committee, the Architectural Branch of the Provincial Department of Public Works began working on the outline of requirements for these multiple-purpose buildings which would be used for cultural, educational, recreational and religious functions, with facilities provided for exhibition purposes and other activities of organizations "representative of the various communities and interests of Alberta citizens."

The three basic forms of theatres, the ancient Greek amphi-theatre, the more conventional legitimate theatre and the experimental playhouse, were carefully considered in relation to the many functions which these new auditoriums were to perform.

A study was made of the professional data and literature of a large number of existing theatres and auditoriums, among them such outstanding examples as the Kleinhans Music Hall in Buffalo, the Radio City Music Hall in New York, the Cleveland Auditorium, the Royal Festival Hall in London, the Malmo Theatre in Malmo, Sweden, the "Congress House" and "Tonhalle" in Zurich, Switzerland, the Concert Hall in Gothenburg, Sweden, the "Aalborg Hallen" in Aalborg, Denmark, the Liverpool Theatre and the Manchester Free Trade Hall in England. From this study it became evident that it would be impractical, for the intended uses, to build either an arena-type auditorium with the stage platform at the centre and a huge seating area around, or to experiment with the conception of a highly mechanized and electronically operated playhouse, heralded at present by many enthusiasts as the all-purpose theatre of the "atom age". The decision to erect a legitimate - type theatre with supplementary facilities for recreational, educational and various social functions was based on many considerations, the most important being that wider and more varied use could be made of a gathering place suitable for accommodating visiting orchestras, operas, road shows and other large dancing and dramatic productions as well as for the presentation of local art of many kinds. It was also felt that private enterprise and municipal governments would, in years to come, eventually respond to public demand for other cultural and recreational centres which would serve the community in markedly different cultural ways than a public auditorium could do.

Within a month of the first announcement, a detailed outline of basic requirements and three preliminary sketches had been submitted to the committee. By August 10th, soil tests had been made and sites approved in both Edmonton and Calgary.

By the middle of the following month the Cabinet Committee tentatively approved the preliminary plans for a fan-shaped hall with a seating capacity of 2,700, a large stage and the essential backstage rooms, with necessary reception lobbies, exhibition areas and social rooms at different levels of the proposed structure.

From the beginning of the sketch work, great importance was attached to a scientifically correct approach in the use of applied acoustics relative to the auditorium itself. Extensive studies were made to ensure that the acoustics of the hall be designed as precisely and perfectly as today's knowledge and experience of the entire domain of acoustics would allow.

Acoustical calculations were carefully checked and re-checked and extensive scientific research was carried out to determine the data for all finishing materials. Expert consultation and advice were sought from many sources. Numerous acoustical measurements were made in the sound laboratory of the National Research Council in Ottawa to select the most satisfactory upholstery and cushioning for the auditorium chairs, to determine the proper combination of highly reflecting and resonating wall panels, and to choose the proper flooring materials. The functions of the extremely complex acoustical ceiling with its differently curved and shaped reflecting sections were carefully computed and all other areas of the auditorium proper—the rear walls, moulded soffits under the first and second balconies, curved front balustrades of the balconies and floor covering of the aisles—

were acoustically calculated, and all of these acoustical elements integrated and correlated with the architectural design.

Plans for special celebrations in 1955 to mark the fiftieth anniversary of Alberta's entry into the confederation of Canadian provinces made it imperative to begin construction before the end of 1954. This meant that only major working drawings could be completed before excavation and the construction of footings and foundation commenced. Thus it was necessary to continue the designing of details almost throughout the progress of construction work.

Erection of the first structural steel on both sites commenced in the summer of 1955, but work was soon impeded by a nation-wide steel strike in the United States where the large steel sections for the main structure had to be milled. It was not until the late spring of 1956 that a full schedule of construction work got under way.

In the meantime, detailing of the interior had progressed rapidly and contracts had been awarded for the fabrication of all special materials and equipment. With the acceleration of the construction on both job sites in the latter part of 1956, all phases of the work were co-ordinated with the objective of having both buildings in operational condition by the end of April, 1957.

The deadline was met and an acoustical test concert, which confirmed the high expectations of the design team, took place on April 8, 1957.

On April 28th, just three years after the proposal to erect the auditoriums was announced, the buildings were dedicated in colorful ceremonies, followed by a full week of specially arranged entertainment in both auditoriums.

Specific technical details of all planning, architectural, structural and acoustical data, mechanical and electrical installations, etcetera, may be found in the appendices at the back of the book.

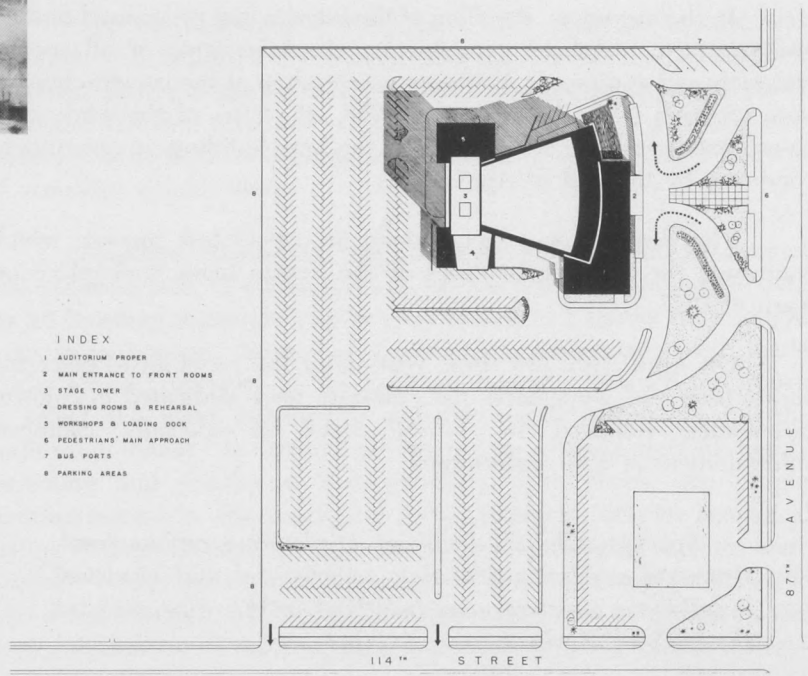
EDMONTON

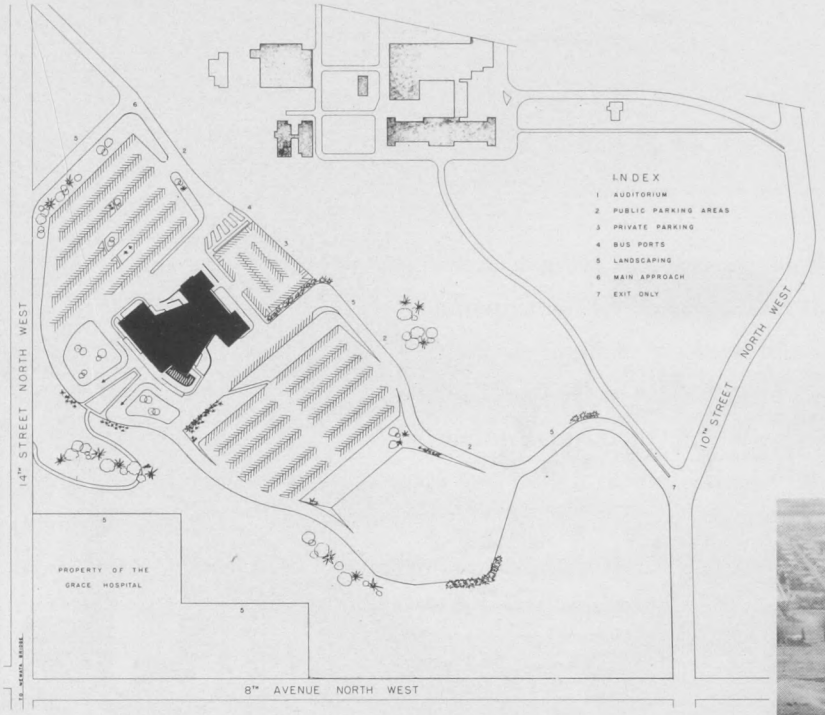
The main approach to the building is provided by 87th Avenue, a major city thoroughfare, easily accessible from all parts of the city by several main traffic routes and bridges. Two four-lane driveways lead to the front entrance at either side of a central pedestrian walkway and motorists may discharge their passengers at a marquee-covered walk on both sides of the main entrance. Bus ports for special bus service are off the main traffic lines. The paved parking area will accommodate 850 cars, and special exits into 114th Street make it possible to clear the lot entirely within fifteen minutes.

The Sites

Away from the congested city centre, the Northern Alberta Jubilee Auditorium stands on a 13-acre plot adjacent to the campus of the University of Alberta, and from the upper balcony levels commands a splendid view, across the North Saskatchewan River valley, of the north bank skyline. Extensive landscaping of the grounds will provide lawns, shrubs, trees and flower beds as a gracious setting for the auditorium.

It is expected that the unsightly buildings to the east of the site will be replaced shortly by new structures more in harmony with the regal front of the Jubilee Auditorium.





Overlooking the city and the eastern slope of the Rocky Mountains from Calgary's North Hill, the Southern Alberta Auditorium occupies a choice 26-acre site on the grounds of the Provincial School of Technology and Art, adding a striking new landmark to the city's skyline. Surrounded by spacious grounds that will be beautifully landscaped, the structure presents a most pleasingly clear-cut and uncluttered silhouette from every direction.

CALGARY

Main access route to the auditorium is 14th Street North West, linked to the downtown area by the Mewata Bridge. The entrance to the auditorium is approached by motorists and pedestrians in the same manner as its counterpart in Edmonton, but exit from the grounds is made by way of 10th Street, North West. Paved parking areas on three separate levels of the site provide space for 1,000 cars, and a further area has been set aside for extra parking, if required, at a future date.

Architectural Design

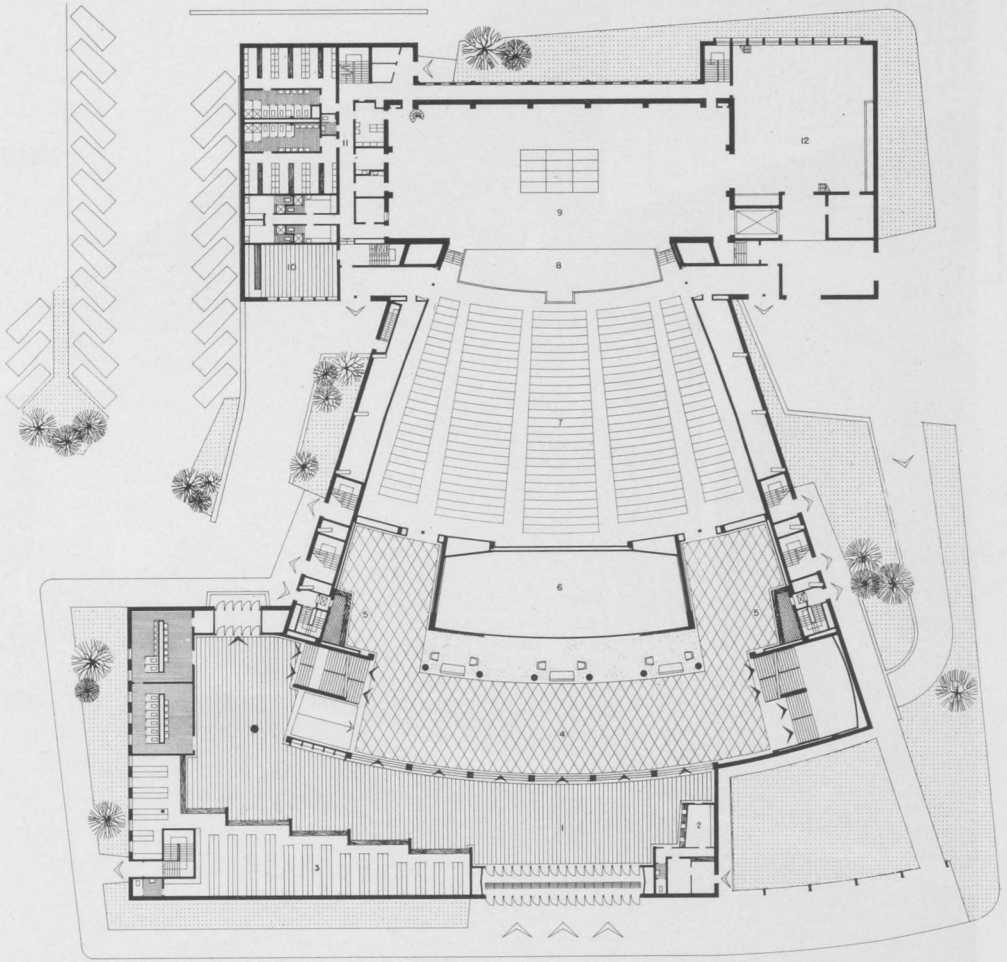
We see, in this new auditorium, a great building obviously designed for a specific purpose. The motivation for the structure, the achievement of a superb acoustic shell, is implicit in every line of its exterior design and mass, in every detail of its interior plan and decoration. The complexity of its multiple functions and attendant services is subordinated in the scale and design of the edifice to the dominant intention, the keynote of the whole plan: the provision of the most perfect possible conditions for the establishment of that almost mystic relationship between performers and audience, that delicate attunement of the essential participants in the presentation of a truly satisfying performance. This is the fundamental feature of the structure. All ancillary facilities and services are simply extensions of this one prime purpose, mere handmaidens, actually, to the convenience, comfort and enjoyment of performers and audience.

Entirely free of any form of architectural pretension, the building makes an honest and forthright statement of its purpose, and clearly visible in the modernity and economy of its uncluttered exterior one may see the essential shape of the great fan-shaped auditorium and its high stage tower. Large architectural concrete panels and brick veneer are used in conjunction with the huge glass panels which form the impressive curved facade of the auditorium proper, and through which one has an unobstructed view of the upper promenade areas and the connecting staircases.

The large open main lobby, beautifully designed as a gracious background for the color and movement of the gathering audience, provides a smooth flow of traffic through wide doors to the auditorium proper and up broad stairways at either end to the upper balcony levels. Grouped around the auditorium proper, in the wings at either side, below it, and under the main lobby are all the many auxiliary rooms, the great complexity of facilities and services necessary for the proper functioning of this tremendous and complicated building.

MAIN ENTRANCE LEVEL

Seventeen glass doors at the entrance lead into the foyer, with the box office to the right and the coat checking to the left. Crossing the entrance foyer, one mounts three risers to the brilliantly lighted main lobby with its spacious open promenade area and furnished lounge area. Audience traffic flows smoothly through the lobby to the staircases which lead from either end to the upper balcony levels, and through left and right entrances into the auditorium itself. The main floor has a seating capacity of 1,268, which is slightly less than half of the total capacity. Flanking the stage on either side at the same level are the performers' dressing rooms, the Green Room, the workshops, and the enclosed loading platform.

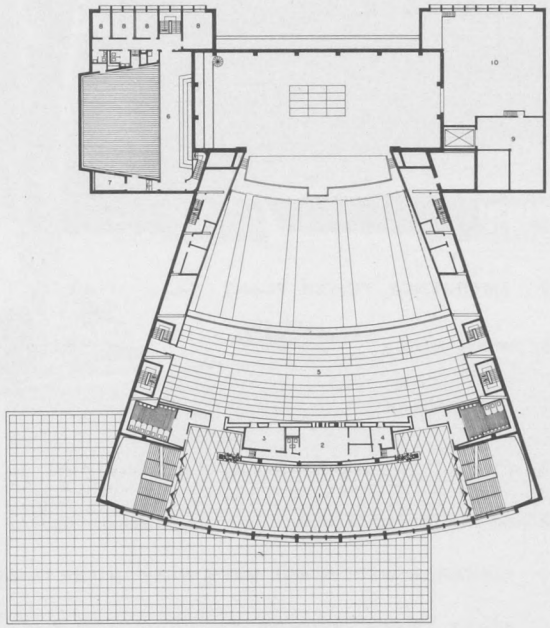


1. FOYER
2. TICKET OFFICE
3. CLOAKS
4. MAIN LOBBY
5. CONCESSIONS
6. UPPER PART OF SOCIAL ROOM
7. FRONT STALLS
8. ORCHESTRA PIT
9. STAGE
10. GREEN ROOM
11. DRESSING SUITE
12. WORKSHOPS

SOCIAL ROOM LEVEL

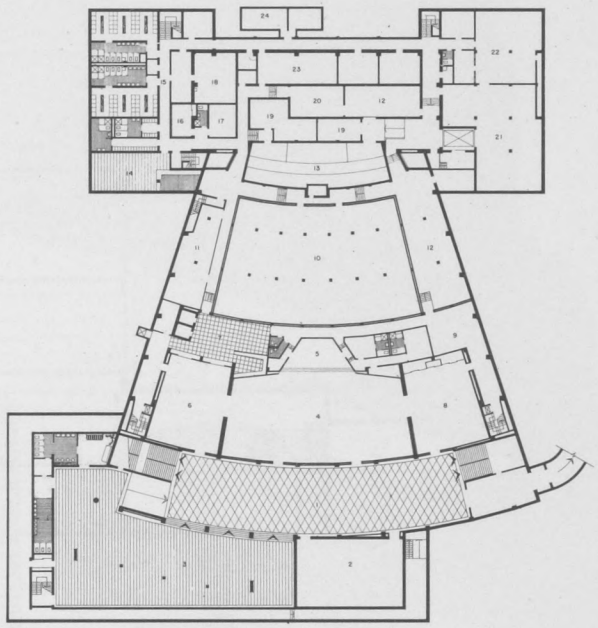
SOCIAL ROOM LEVEL

Descending from the main lobby, one enters the social room level with its wide lobby and adjacent exhibition area. The large social room, with its own stage, opens on a banquet room at one side and an assembly room at the other. Across the foyer is a large clubroom. Directly behind the banquet room is the big service kitchen, further behind which are the mechanical rooms. A corridor separates this area from the orchestra pit and adjacent orchestra dressing rooms, musicians' lounge, conductor's room, music library, scenery docks and trap room below the stage.



1. UPPER LOBBY
2. PROJECTION SUITE
3. SOUND CONTROL ROOM
4. RADIO AND T.V. BOOTHS
5. GRAND CIRCLE
6. REHEARSAL STAGE
7. BROADCASTING ROOM
8. PRACTICE ROOMS
9. UPPER STORAGE
10. UPPER PART OF WORKSHOP

1. LOWER LOBBY
2. CLUB ROOM
3. EXHIBITIONS
4. SOCIAL ROOM
5. PLATFORM
6. BANQUET ROOM
7. SERVICE KITCHEN
8. ASSEMBLY ROOM
9. CHAIR STORAGE
10. MECHANICAL ROOM
11. AIR CONDITIONING
12. GENERAL STORAGE
13. ORCHESTRA PIT
14. MUSICIANS' ROOM
15. DRESSING SUITE
16. CONDUCTOR'S ROOM
17. MUSIC LIBRARY
18. COSTUME SHOP
19. INSTRUMENT STORAGE
20. TRAP ROOM
21. SCENERY DOCKS
22. PRODUCTION STUDIO
23. ELECTRICAL
24. EMERGENCY PLANT



UPPER LOBBY LEVEL

The attractive promenade and lounge at this level opens into the Grand Circle which seats about one third of capacity audience. Projection rooms, the sound control room and radio and television booths operate here. Ancillary backstage accommodation at this level includes the rehearsal stage, practice rooms and a broadcasting room.

Above the Grand Circle is the Upper Balcony, seating about one fourth of capacity audience. A third promenade and lounge area offers a pleasant interlude for members of the audience during intermissions. From this lobby, and from the first balcony level, the great curved wall of glass panels presents a spectacular panoramic view of the city.

LONGITUDINAL SECTION THROUGH AUDITORIUM PROPER

1. SHELTERED UNLOADING CURB AND MAIN ENTRANCE
2. FOYER WITH BOX OFFICE, CHECK COUNTERS AND RESTROOMS
3. LOBBIES WITH GRAND STAIRS AT BOTH ENDS
4. CLUB ROOM AND EXHIBITION AREAS
5. MAIN SOCIAL ROOM WITH FLANKING SMALLER ACTIVITY ROOMS
6. MAIN FLOOR OF AUDITORIUM PROPER
7. FIRST BALCONY OR GRAND CIRCLE
8. SECOND BALCONY
9. PROJECTION AND SOUND ROOMS
10. MECHANICAL ROOMS
11. ORCHESTRA PIT
12. INSTRUMENT STORAGE
13. TRAP ROOM
14. ELECTRICAL ROOM
15. EMERGENCY POWER PLANT
16. MAIN STAGE
17. FLY GALLERY
18. PROSCENIUM OPENING AND FIRE CURTAIN
19. LOADING PLATFORM
20. GRIDIRON WITH STAGE MACHINERY IN THE FLIES
21. STAGE TOWER LOUVERS

Architect's Perspective of the Jubilee Auditoriums

AUDITORIUM PROPER

Essential core of the entire building, the nucleus around which all other ancillary parts are planned, is, of course, the auditorium itself. Here is the "raison d'être" for all the complex, carefully designed structure. In the success of this acoustic shell lies the success of the entire edifice. Had the auditorium failed in its one vital function—the establishment of an intimate performer-audience rapport through sight and sound—then all the provision of auxiliary services, the beautifully planned decor, the care and thought for personal comfort and convenience, would have become purposeless. That it has succeeded admirably in its prime purpose is now a manifest fact.

Spatially, the big fan-shaped hall with its splay walls of polished French walnut is at once exciting and satisfying. Obviously its shape and size are determined by the work it must perform. Devoid of meaningless embellishment, it achieves much of its decorative effect through the intrinsic beauty of its acoustical design. The sectional ceiling of large moulded plastered panels, the inward tilt of the side walls, the forceful sweep of the balcony soffits, the random pattern of acoustic tone cabinets and perforated tiles over the carpeted and insulated rear walls, the carpeted aisles, the padded doors, the very seats, all serve as aids to acoustic perfection.

Illumination of the hall is warm and full of mood. Variety and sparkle, as opposed to the flat quality of indirect lighting, are obtained through the use of many small bright lights set in the ceiling and supplemented by larger light fixtures under the balconies.

One of the largest on the continent, the stage measures 48 feet deep and 120 feet wide, with a proscenium opening 76 feet wide and 36 feet high, which may be reduced for small productions by the use of teasers, tormentors, draw curtains and drapes. The forestage over the orchestra pit is 17 feet deep. Seating in the stalls and the two balcony areas has been carefully arranged for good sightlines to the stage, as well as good acoustics, from every point in the hall.

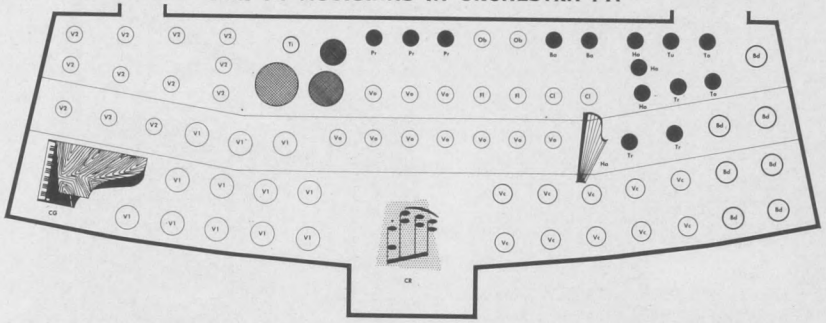
View of the auditorium, seen from the stage

The rehearsal stage is provided with specially designed sound units on the walls to achieve proper acoustical conditions.

ORCHESTRA LAYOUT

The orchestra pit is placed partially under the stage apron and provides space for 70 or 75 musicians on a stepped platform. The conductor's rostrum is set at an intermediate height to permit the conductor to follow action on-stage while conducting the orchestra. Below the podium is the lighting control panel for stage and house lights, operated by the chief lighting engineer.

TENTATIVE ORCHESTRA ARRANGEMENT FOR 74 MUSICIANS IN ORCHESTRA PIT

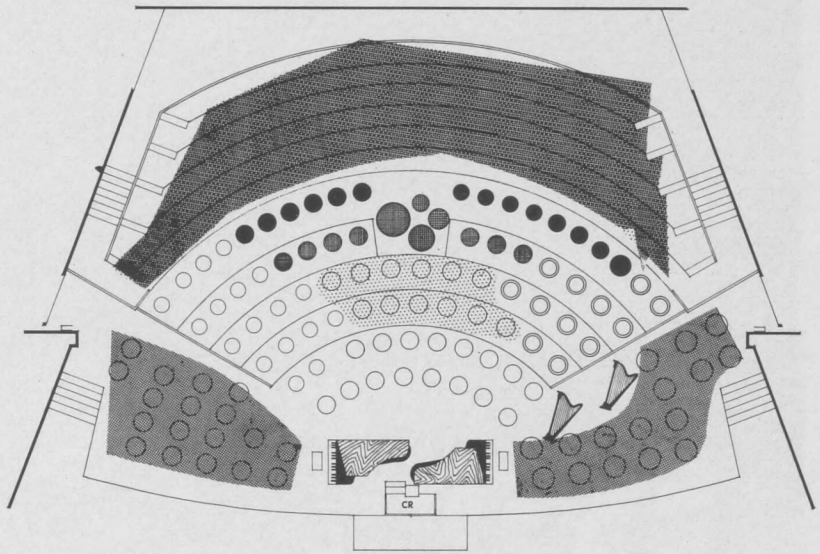


CR	CONDUCTOR'S ROSTRUM	HA.	HARP (1)	HO	HORNS (3)
V1	FIRST VIOLINS (12)	FL	FLUTES (2)	TO	TROMBONES (2)
V2	SECOND VIOLINS (12)	CL	CLARINETS (2)	TU	TUBA (1)
VO	VIOLAS (10)	OB	OBOES (2)	TI	TIMPANI (1)
VC	VIOLONCELLOS (10)	BA	BASSOONS (2)	PR	PERCUSSION (3)
DB	DOUBLE BASSES (7)	TR	TRUMPETS (3)	CG	CONCERT GRAND (1)

REHEARSAL STAGE

Artists preparing for a performance here find excellent rehearsal facilities for every type of production. The large rehearsal stage is identical in area to the acting part of the main stage. It is possible also to seat up to 100 people in front of the rehearsal stage for any desired intimate performances. A convenient broadcast control room looks out over the stage. Also on the rehearsal stage level are several practice rooms for soloists. Lounge rooms with kitchen facilities near the dressing rooms make the long rehearsal hours spent in the building pleasant and comfortable for artists and musicians.

By covering the orchestra pit with large floor panels and erecting a prefabricated orchestra shell, the stage is extended to accommodate a symphony orchestra of 100 to 120 musicians and a choir of 200 to 250, grouped on graduating risers, giving the audience a splendid view of the performers as well as superb sound reception.



SUGGESTED FULL ORCHESTRA LAYOUT ON MAIN STAGE EXTENDED OVER COVERED PIT FOR 116 MUSICIANS AND 220 VOCALISTS

STRINGS:
1ST VIOLINS AT LEFT
VIOLONCELLOS AT RIGHT

STRINGS:
2ND VIOLINS, VIOLAS, DOUBLE BASSES

WOODWINDS:
FLUTES, CLARINETS, OBOES, BASSOONS

BRASS:
TRUMPETS, HORNS, TROMBONES, TUBA

PERCUSSION AND TIMPANI

CONCERT GRANDS AND HARPS AS SHOWN

CHORUS

CR CONDUCTOR'S ROSTRUM

The Social Room features a raised platform for musicians or lecturers.

SOCIAL ROOM

From a wide opening at the rear of the main lobby one looks out over the main social room at the lower level. Suitable for assemblies of many kinds—meetings, receptions, dances and small performances —this room may be closed off by drawing the heavy, soundproof drapes, or, to gain an effect of lavish spaciousness for balls and receptions, it may be left open to view from the main lobby.

A raised platform for musicians, lecturers, fashion shows or small, intimate productions is equipped with stage lighting, draw curtains and dressing rooms. Seating for approximately 450 persons is provided by upholstered stacking chairs which are removed when not required. Closed circuit television installations make it possible to accommodate an overflow audience here, who may watch on large TV screens the performance taking place on the auditorium stage.

This room is flanked on either side by two smaller rooms, a banquet room and an assembly room, and all three may be linked to handle a gathering of some 1,000 persons. In these rooms, resilient hardwood floors, resting on padded steel springs, are superb for dancing.

EXHIBITION AREA

The large exhibition area on the lower floor features recessed picture moulds along three well lighted walls for hanging paintings, photographs and other art exhibits, while special glass-panelled display cases will protect displays of art objects and handcrafts. Further use of the large open space formed by this area and the wide lobby linking the lower floor rooms will be made by automotive and equipment shows, and by industrial and manufacturers' exhibits of many kinds. Polished terrazzo floors, glowing dark wood walls set with panels of richly colored tiny mosaic glass tiles introduce both warmth and elegance, a difficult achievement in wide open areas of this type.

An Appreciation

BY RICHARD J. NEUTRA, F.A.I.A., R.I.B.A.

Distinguished Architect and Lecturer of Los Angeles, California and Honorary Member of the Alberta Association of Architects

Canada is often enough compared and brought into parallel with the United States. But not only is its absolute and relative free area larger, and its time dimension into a great future fascinatingly unlimited, but its frontier is still open, not closed.

Still in this century, man may gloriously and ominously control climate. Such is the promise of scientists, and it is possible that all parts of the planet's surface, including the arctics, will be habitably readied for his activities. Meanwhile, interiors which first were dark, chilly caves only a few thousand years ago, and most welcome in their crudity when the glaciers descended, have become the stage of technical miracles in liveability.

Size of interiors has been the first problem posed to human ingenuity. Spans and vaultings have occupied engineering minds for times long before the Hagia Sophia in Byzanz. And the space frames of Luigi Nervi, the thin shell roof shapes of Dischinger, Torroja, Candela are not the last we shall see. But hugely sized interiors have only now been managed acoustically. Without this, all past structural engineering was only half an accomplishment; all shaping of wide-span interiors for vision could not truly and fully satisfy. The organic needs of man, especially when he wishes to enjoy large assembly, include, above all, auditory satisfaction.

The very word "Auditorium" expresses this.

Vern Knudsen, leading acoustical expert, has advised the architects of the Province of Alberta in the creation of the so remarkable Provincial Auditoria of Edmonton and Calgary. The people of Alberta, perhaps more than theatre-goers and concert listeners anywhere in the world, will enjoy the auditory subtleties to which grand interiors can be tuned by means of exact analysis and cautious advance testing of all parameters and contributing factors.

When I had the privilege to be, during a winter night of deep sub-zero temperature in the Edmonton Auditorium, nearing completion, I was happy that a good heating engineer was on the team, and the flux of heat well under control, even while we watched, during these ghostly hours between 12 and 2, the testing of acoustical energy flowing through the still sparsely illuminated and unfinished interior. Here were posted the electronic sound machines. Graphs began to zig-zag characteristically before our eyes, while low frequency thunders swelled and died down in distant reverberations. I thought how many spirits would be moved in years to come by this advance acoustical care which from our time on will always be paired with the care for vision.

Man's inner being is moved by all the senses in mysterious fusion and it has long been my credo that an architect is not an artist of the eye alone. Architecture is "space-time art" with the flux of energy playing through time and space to reach human senses and human hearts.

Music and human voice will be cherished in Edmonton and Calgary long after the faithful devoted design team has departed from this stage. A perennial service has been rendered to the people, to the lovers of music and the dramatic arts.

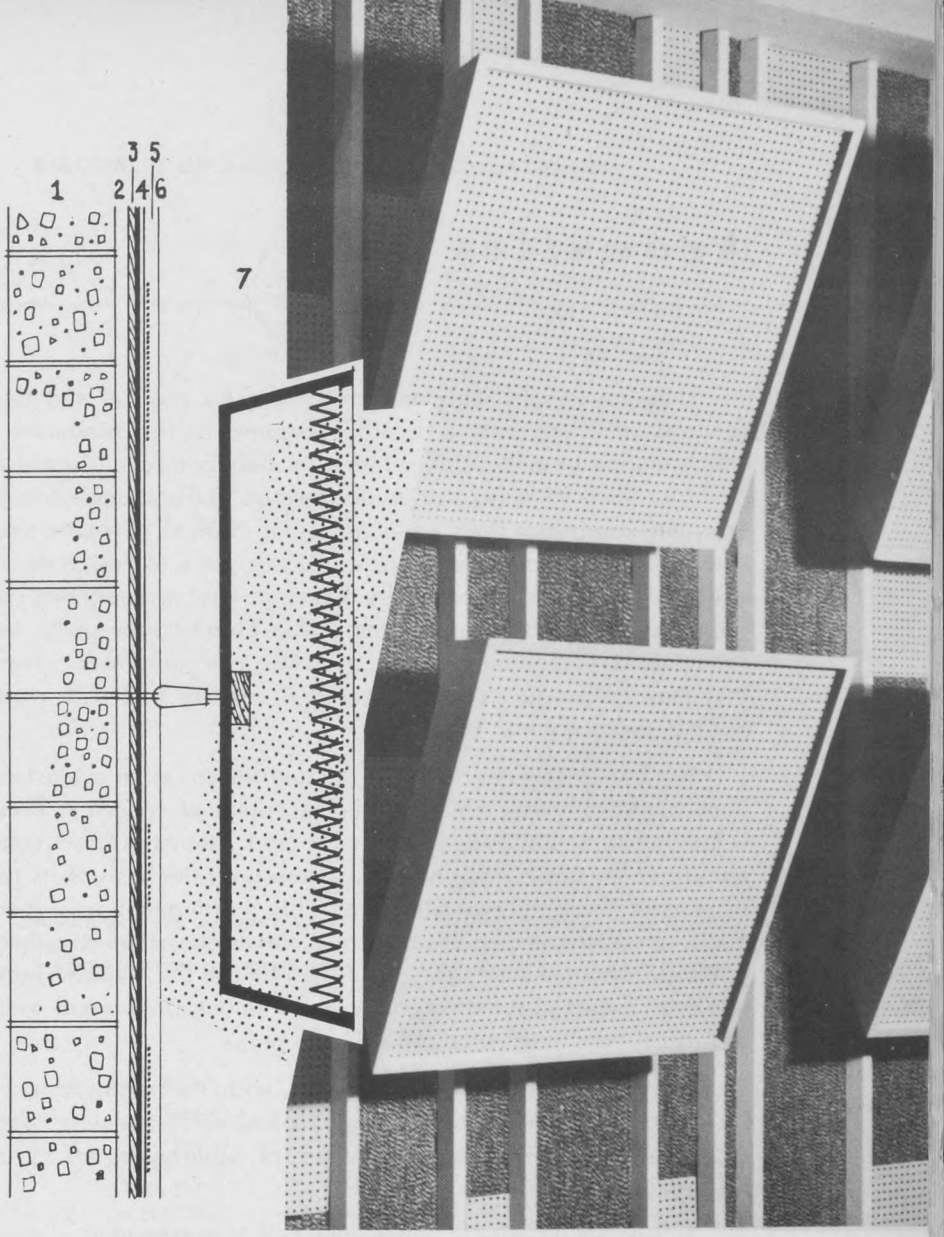
BY VERN O. KNUDSEN

Vice Chancellor, Dean of Graduate Division
and Professor of Physics, University of California

The acoustical design of a concert hall is more than a work of science; it is as well a work of art. The criteria for optimum acoustical quality, for performer as well as listener, are primarily objective, are subject to mathematical formulation, and can largely determine the outcome in such important matters as reverberation, distribution of direct and reflected sound, diffusion, echoes and noise. But most of these objective criteria are dependent upon subjective judgments or musical tastes, such as the optimum reverberation characteristics for different kinds of music, the proper loudness, and the most favorable ratio of direct to reflected (delayed) sound. The acoustical designing of a concert hall is thus scientifically and artistically a complex project, calling for team work of the highest quality, where architect, acoustician, musician and listener join hands to create an environment where the heart can be gladdened with music.

My cursory examination of the plans and acoustical analyses for the new Edmonton and Calgary auditoriums indicated that the acoustical designing of these auditoriums was based on correct acoustical principles, and was characterized by a proper emphasis of the requirements for concert halls. There was, from the first, a high probability that the outcome in the acoustics of these auditoriums would be good. The prognosis was very good, but the ultimate excellent outcome could not be determined until acoustical tests, including the test concert in April, 1957, were made, and was indeed, improved by the findings of these tests and by adjustments based on later criticisms of cultivated listeners.

Alberta, by building these two splendid auditoriums, has earned the approbation of her culture-loving citizens and of music lovers throughout the world. These edifices certainly testify to Alberta's appreciation of the best in music and architecture as indispensable parts of good living.



COMPOSITE ACOUSTICAL TREATMENT OF REAR AUDITORIUM WALL

1. Lightweight cellular, aerated concrete block Ytong.
2. Furring strips 16" O.C.
3. Plywood sheathing.
4. Strips of dense "Nyltex" carpet (10% nylon and 90% cotton) on ¼" wool felt in random width.
5. Perforated presswood boards ⅛" thick with holes 1" O.C. applied over carpet in random pattern.
6. Bevelled white pine strips random spaced.
7. SR-Cavitone of solid wood frame ¾" x 5⅝" with 3/16" perforated asbestos front panel over 2" rigid "Fibreglas" insulation sheet of 4 - 5 lbs. density, ¼" perforated presswood back panel and adjustable tilting device.

Acoustics

It is not so long since buildings used for musical and theatrical performances had only a limited response to the produced sound, which tended to make each suitable for only one type of presentation. Auditoriums built today are "multi-purpose" halls, intended to provide adequate conditions for a wide variety of musical, dramatic and other varied forms of expression. Thus it was necessary to design the Alberta auditoriums for such acoustically diverse events as symphony concerts, full-scale opera, legitimate drama, Little-Theatre type plays, chamber music, solo performances and speeches—for practically everything that may be produced and observed in a large hall with permanent seating and a stage in front.

For music, one may think of the auditorium as an extension of the musical instruments, while for the reception of speech it becomes a communication link between speaker and listener. Consequently the quality of the auditorium must be assessed on the basis of its response in serving these various functions. This requirement was one of the major problems in the entire acoustical design. Expert opinion and public acceptance have now established that in these auditoriums there has been achieved a happy compromise among the several conflicting acoustical conditions required.

The acoustical design itself dealt with the application of such theoretical principles as uniformity of sound, diffusion versus directionality, value of reflections, behaviour of absorbents, effect of path differences, etcetera.

It was found that a fan-shaped hall best provided a good view of the stage for the largest number of people. Details of the shape were worked out by an elaborate ray analysis which included consideration of intensities and arrival times of the major reflections.

Since directly transmitted sound diminishes in amplitude and importance with the increase of the distance from the source to the listener, and since, beyond 50 feet, the character of the received sound is chiefly determined by the reflections, it was required that the main ceiling and the soffits under the balconies reflect as much sound as possible into the rear parts of the seating area. The ceiling soffits were designed as a multitude of panels of hard, smooth gypsum plaster, located and shaped mainly in accordance with these acoustical considerations.

Because the high proscenium arch necessary for stage purposes introduced the possibility of delayed reflections to the front part of the seating area, the front ceiling sections were made convex to reduce the intensity of such reflections to a safe level.

The side walls of random-patterned, built-up plywood panels of low absorbing frequencies present a slightly tilted-inwards, unbroken and uniform surface that forcefully directs the eye to the stage. Acoustically, these panels are made with two different absorptive properties which together form a somewhat diffusive surface for low freqency sound.

To protect against the well-known acoustical problem of "slap-back" from curved rear walls, these are broken in plan and constructed of absorptive and diffusive elements such as random-spaced wood moulds, perforated boards, low pile and dense carpet strips on wool felt, and specially developed acoustical panels mounted over the composite wall finishes and provided with a tilting device for adjustments in their directionality, should this be desired for different acoustical conditions. Through these means the rear wall reflects some sound usefully and safely into the rear seating area and "slap-back" does not occur.

For symphonic music a collapsible orchestra shell with steep risers for orchestra and choir can be erected on the stage to transform the otherwise musically dangerous stage tower into a continuation of the auditorium itself.

Besides being comfortable, the chairs also fulfill an acoustical function of moderate absorbency, and are designed to have the same acoustical qualities when occupied as when empty. A good wearing carpet covering for the aisles dampens the sound of audience traffic.

To supplement and prove the theoretical design, acoustical testing of the major components of the hall—wood panels, chairs, carpets and people—began in the reverberation chamber of the National Research Council at Ottawa in the early stages of the testing program. This was followed by reverberation measurements in the halls themselves as soon as they were closed in.

These numerous acoustical tests culminated in a test concert attended by a design audience of 1,800 people and twelve musical and acoustical authorities who explored the hall from stage to top balcony while the concert and half hour of purely acoustical testing progressed.

In a colloquium following the concert, the experts, without exception, began by comparing the auditorium favourably with the Royal Festival Hall, with the Kleinhans Hall in Buffalo, and with the best European halls, and were in agreement on the following three points:

1. The reverberation time was about optimum for a multi-purpose hall. Some would have liked a somewhat longer reverberation time for symphonic music, but all agreed that it was good for smaller musical groups and for speech.
2. Listening conditions were very uniform throughout the hall. The articulation without the use of electrical reinforcement was found very satisfactory.
3. There was a low-frequency problem associated with the stage area. It was surmised that the orchestra shell was not sufficiently reflecting the low frequency sound. An improvement of the shell was unanimously recommended.

Summarizing, it may be stated that all the refinements of the acoustical considerations ensure that in the Alberta Auditoriums no frequencies are unduly stressed and no echo is heard. Here, the human voice, instruments of music and the audience can work in glorious accord.

DIAGRAMS OF ACOUSTICAL CALCULATIONS

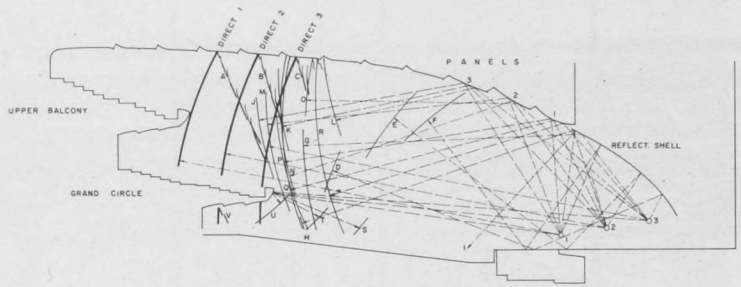


FIG. 1. WAVE FRONT PATTERN $\frac{1}{10}$ SEC. FOLLOWING ACOUSTIC PULSE
AXIS OF HOUSE, VERTICAL PLANE, ACOUST. COND. NO I

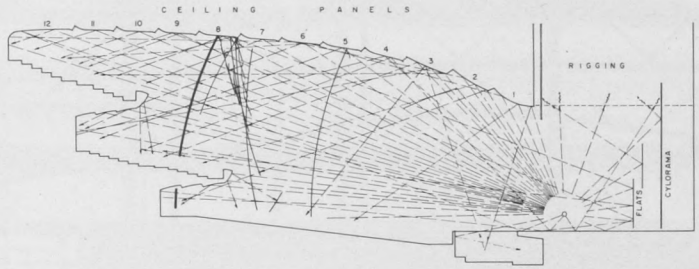
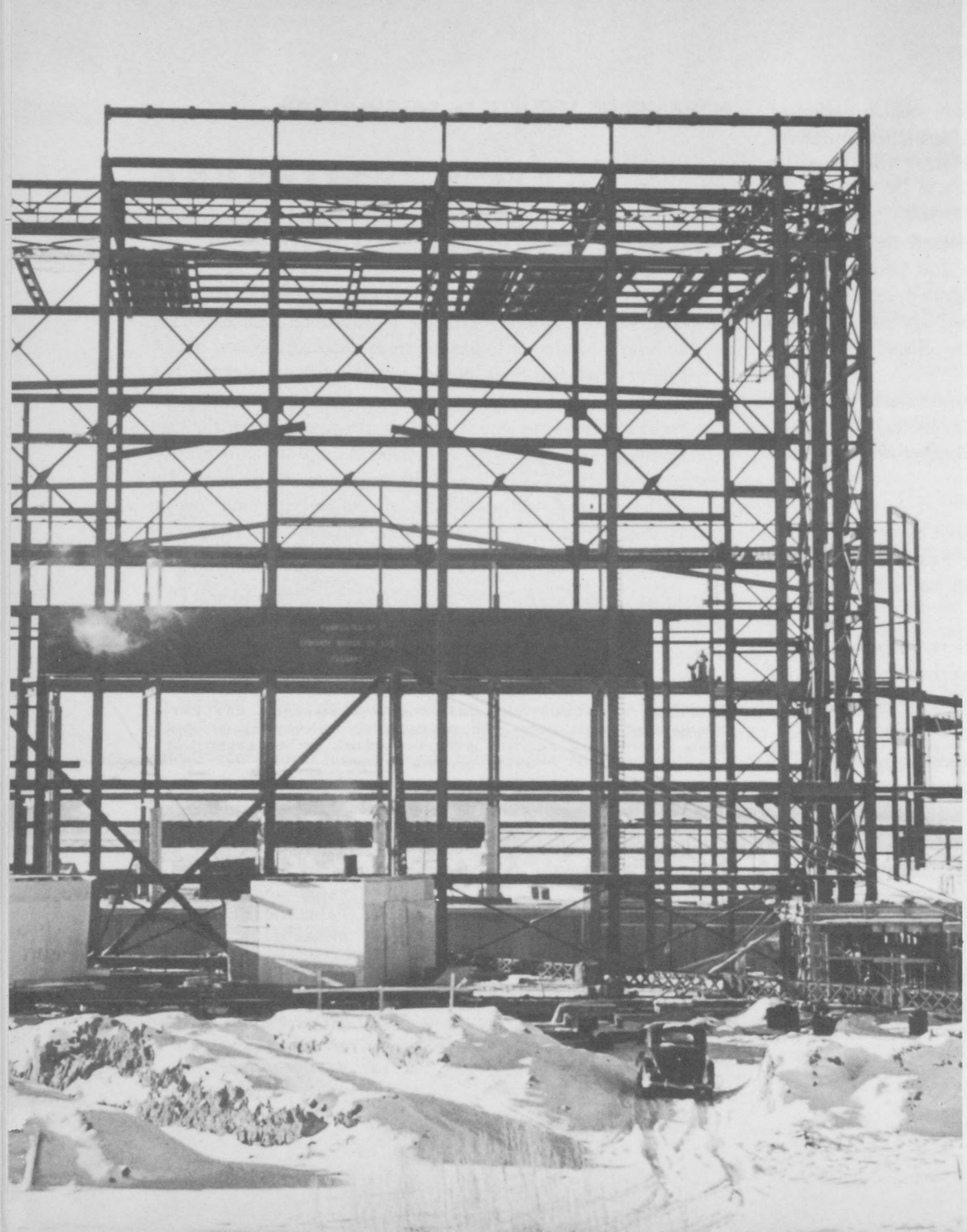


FIG. 2. WAVE FRONT PATTERN, ACOUST. COND. II
$\frac{1}{10}$ SEC. FOLLOWING ACOUSTIC PULSE, SUPERIMPOSED STEADY-STATE COND.
AXIS OF HOUSE, VERTICAL PLANE

DIAGRAMS OF ACOUSTICAL COMPUTATIONS SHOWING RAY PATTERNS RESULTING FROM THE CALCULATED CURVATURE OF THE MAIN AUDITORIUM CEILING WITH INCLUSION OF A REFLECTING SHELL ON THE STAGE

LEGEND: (No.)	SOURCE
A (1)	CEILING
B (2)	CEILING
C (3)	CEILING
D (1)	FORESTAGE (2ND REFL.)
E (2)	FORESTAGE (2ND REFL.)
F (3)	FORESTAGE (2ND REFL.)
G (3)	REFLECTOR SHELL
H (2)	REFLECTOR SHELL
I (1)	REFLECTOR SHELL
J (1)	PANEL No. 3

LEGEND: (No.)	SOURCE
K (2)	PANEL No. 3
L (3)	PANEL No. 3
M (1)	PANEL No. 2
N (2)	PANEL No. 2
O (3)	PANEL No. 2
P (1)	PANEL No. 1
Q (2)	PANEL No. 1
R (3)	PANEL No. 1
S (1)	BALUSTRADE
T (2)	BALUSTRADE
U (3)	BALUSTRADE
V (2)	GRAND CIRCLE SOFFIT



Structure

Of the many factors influencing the structural design of the auditorium, the prime consideration was the speed required in the fabrication and construction of all components. Since the buildings were being erected in celebration of the Province's Golden Jubilee in 1955, it was imperative that the construction commence during 1954.

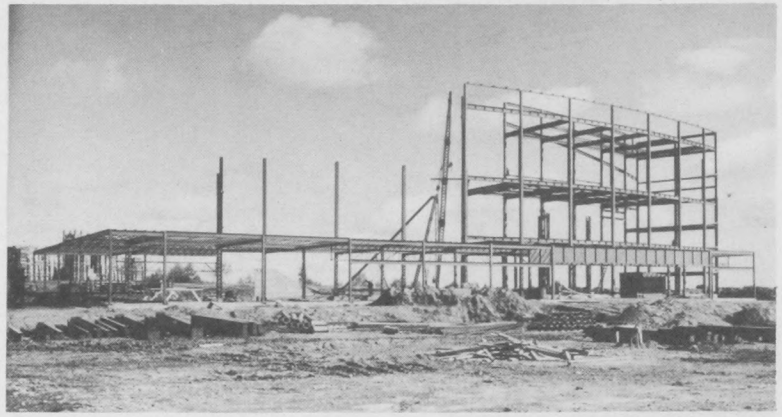
Site preparations began in the fall of that year. Soil conditions of both sites limited the allowable soil pressure under footings to 3,000 pounds per square foot, and structural design proceeded from that premise.

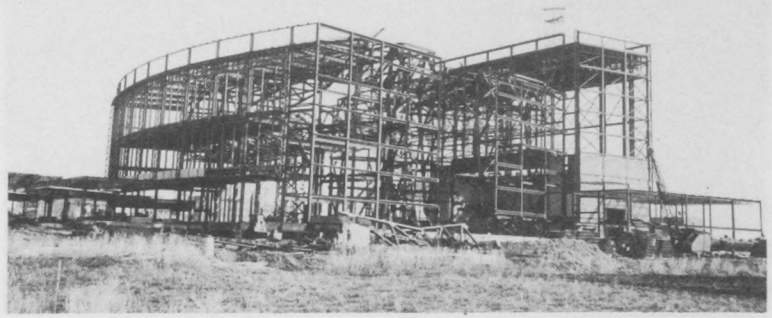
Footings and foundation walls are of reinforced concrete. The sub-structure of the building is composed of three integral units, the main entrance area, the auditorium proper and the stage tower and wings.

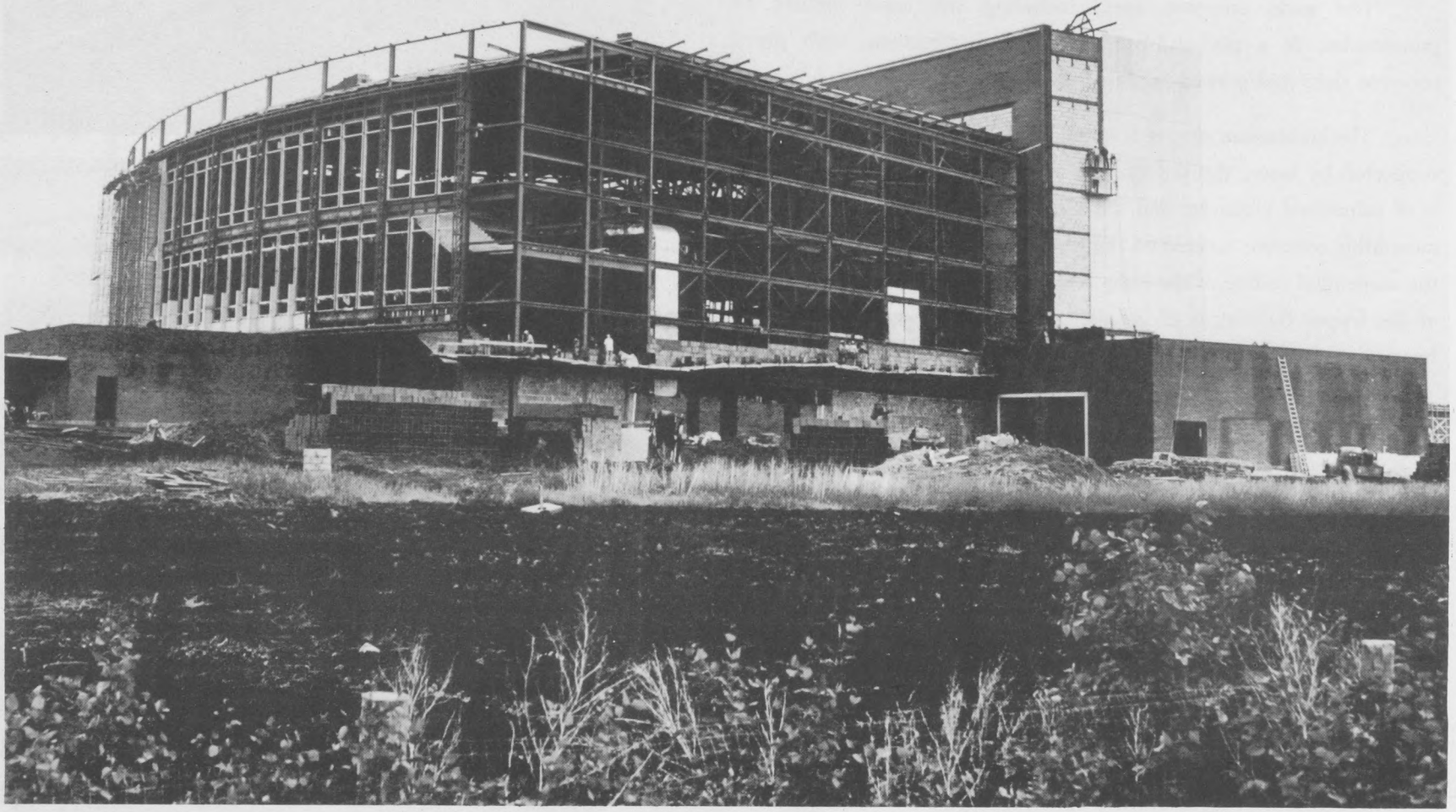
The main entrance area, including the front lobbies and promenades, is a post-and-beam type steel structure, with precast concrete slabs and poured-in-place subflooring.

The auditorium proper is spanned by six three-hinged steel arches, supported by heavy thrust footings. The sloping floor of the front stalls is of reinforced concrete, and the Grand Circle floor is stepped up in monolithic concrete, carried on reinforced concrete beams which support the suspended ceiling of the main social room below. The floor structure of the Upper Balcony is of precast concrete slabs on cantilevered steel beams.

The stage tower and backstage wings are also of post-and-beam construction. Here, the structural design of the tower presented something of a problem in that it is over 100 feet high above the ground, without the usual interior support of the successive storeys that would be an integral part of a normal ten-storey building. Thus the stage roof is designed as a stiffening diaphragm of six-inch cast-in-place lightweight concrete on four-feet-deep steel trusses, and the tower is further strengthened at 85 feet above the stage floor by the gridiron from which all stage scenery, curtains, screens, etcetera, are suspended by means of steel cables operated from the cantilevered fly gallery. Roofs of the other two units are of four-inch light aggregate concrete, carried by open-web steel joists.

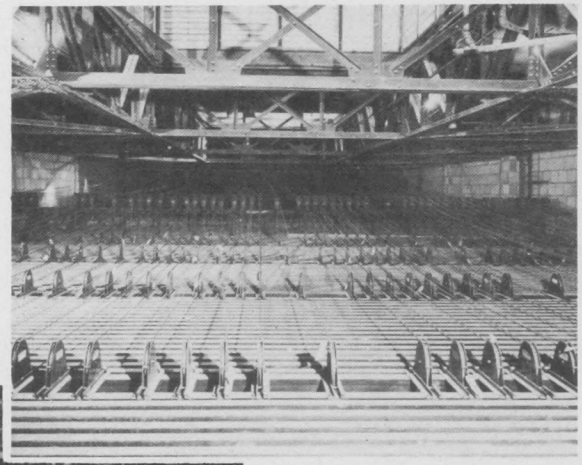




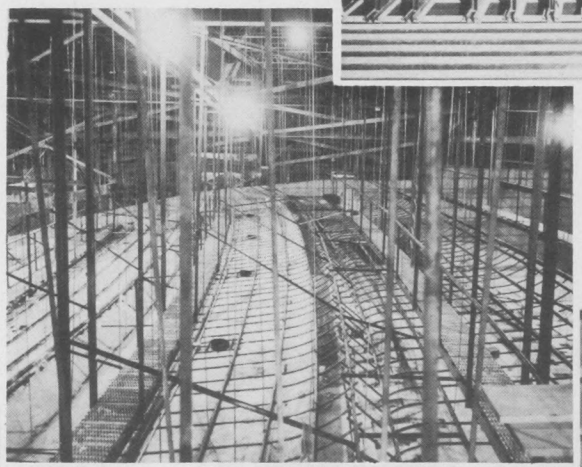


Altogether, 1,400 tons of structural steel and 500 tons of reinforcing rods were used in each building.

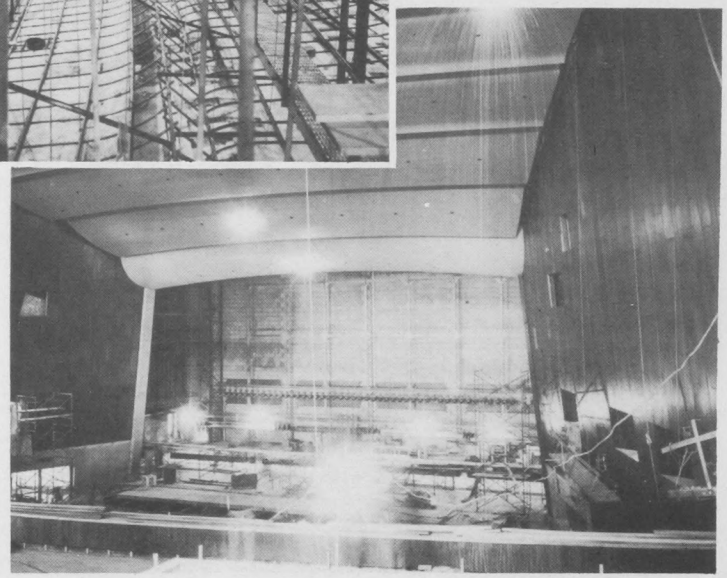
The steel structure is enclosed in clay tiles and lightweight cellular building stone, and most of its exterior is faced with large precast concrete panels with weather resistant granite pebbles polished to a smooth, velvet finish. The remainder of the exterior is in red brick, with the exception of the main entrance, where polished Italian travertine is used. Architectural stone surrounds frame the huge windows of the handsome front elevation.



Construction of the gridiron



Suspension of ceiling panels in auditorium



Heating and Air Conditioning

It was absolutely necessary, of course, to work out a heating and air conditioning system for these buildings which would assure flexible control of temperature and humidity for the comfort of capacity crowds or smaller assemblies in the auditorium proper and in the many other ancillary rooms.

Two large air-handling units, complete with glycol anti-freeze heating coils, heat exchangers, pumps, filters and controls, bring fresh air into the building from outside at the rate of 45,000 cubic feet per minute, and supply the tempered air to the mechanical room plenum

below the main seating area of the auditorium. From here, six large multi-zone air conditioning units, complete with supply fans, steam heating and chilled water cooling coils, zone dampers and humidifiers supply conditioned air to the building. Three fans return air from various parts of the building to the mechanical room. By way of special ducts, 70,000 cubic feet of conditioned air per minute are delivered to the auditorium proper when it is in use. Part of this is returned to the mechanical room, while the balance is exhausted through automatically controlled louvres in the stage tower. Separate fans provide straight exhaust from the kitchen, washrooms and several other rooms, while two smaller air conditioning units supply these areas with fresh air.

Refrigeration for the air conditioning system is provided by a 250-ton water chiller unit with centrifugal-type, hermetically sealed compressor and 200 horsepower motor. Cooling of the condenser water is provided by an evaporative cooling system consisting of piping and spray nozzles on the roof of the auditorium proper. During cold weather, cooling of the auditorium seating area may be achieved through the provision of air from the fresh air pre-heat units located in the main mechanical room.

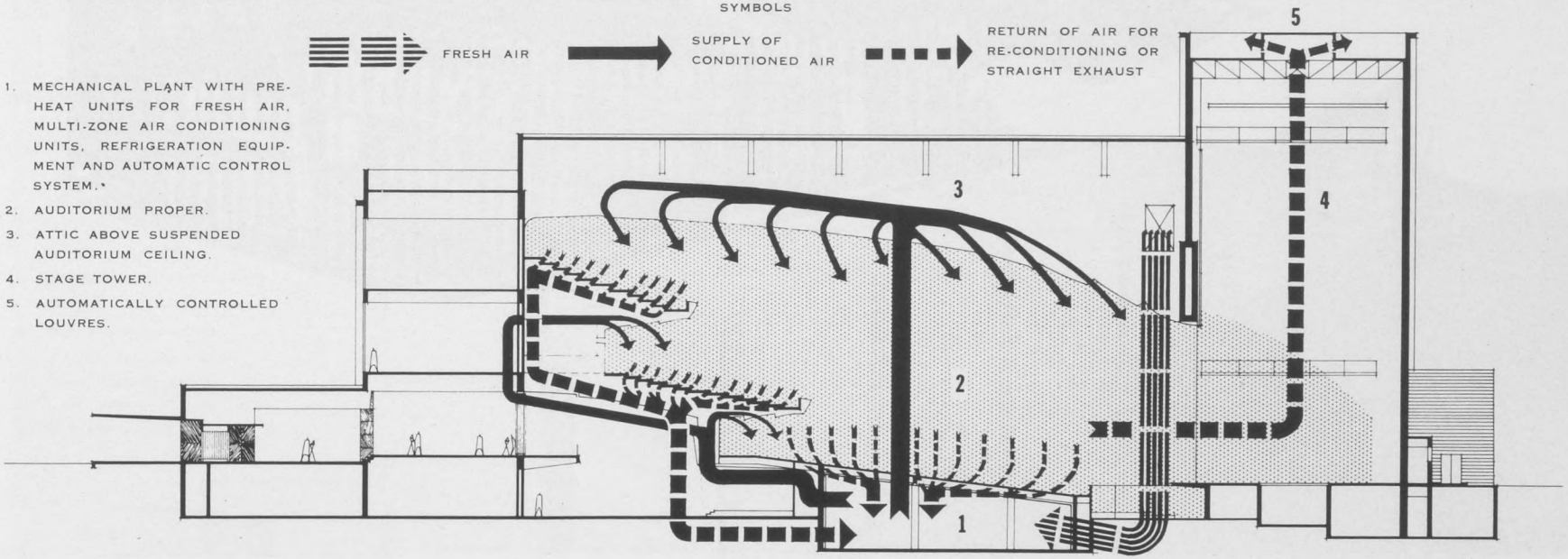
An extensive pneumatic control system allows individual control of the air conditioning and heating systems in various parts of the building. A temperature indicating panel and recorder make it possible for the operating engineer to read and control the temperatures in any of seventeen air-conditioned zones and seven other locations.

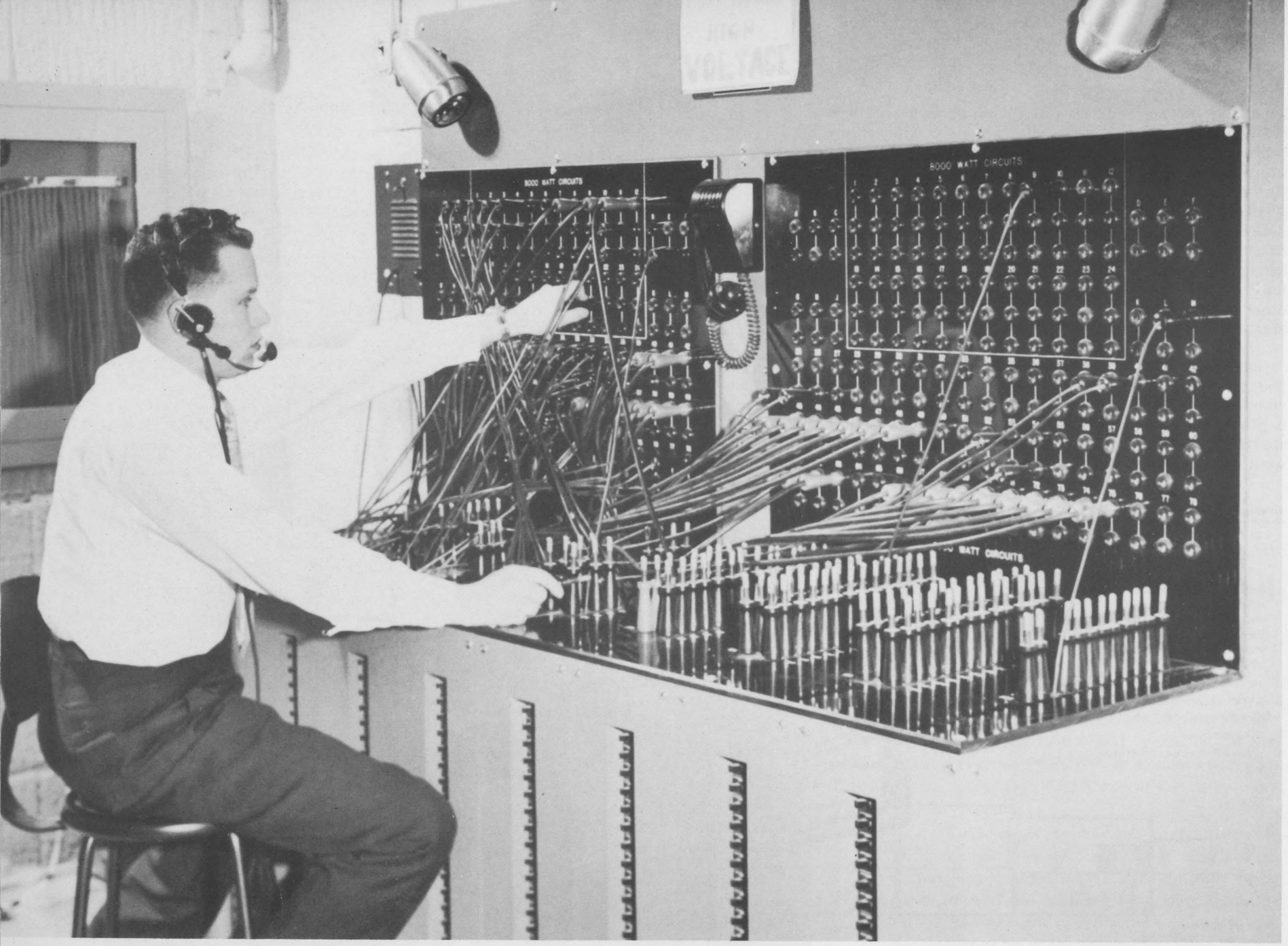
Steam heat radiation is used for several supplementary areas of the building. A radiant heating system for melting snow at the entrance is also installed.

In order to reduce the operating noise of the system to a tolerable level, provision was made for the use of sound-absorbing duct linings, anti-vibration mountings, quiet running equipment and low duct and grille velocity.

Through this complex heating and air conditioning system, comfort is well served and audiences should never have their enjoyment of the performance impaired by suffering extremes of heat, cold or poor ventilation.

SCHEMATIC DIAGRAM OF HEATING AND VENTILATING OF AUDITORIUM PROPER




8000 WATT CIRCUITS
8000 WATT CIRCUITS

Electrical Installation

Obviously, a large multi-purpose auditorium requires a most versatile electrical system to provide the necessary power for all of the varied mechanical equipment, for illumination of all parts of the building, for special house and stage lighting, and for an elaborate sound, radio and television communication network.

A transformer system was selected for the building, with the main switchboard in the electrical room directly below the main stage. From here, power is fed to smaller panelboards in other parts of the building and supplied to two main feeders for the dimming equipment in the auditorium proper and for the mechanical equipment.

Complex stage and house lighting is controlled by the chief lighting engineer from the operating console in the orchestra pit. Through this electronic control system the operator is able to dim or bring on, as desired, any lights on-stage or in the body of the house, or to produce any combination of special stage lighting effects required. He may set the controls for ten cues ahead of the stage action and achieve the desired effects by simply pushing a button on cue. It is believed that this is the first such electronic control system to be installed in Canada, and is one of the few existing on the North American continent.

The stage lighting system has been designed with such flexibility that the show director may create through special lighting effects the desired atmosphere for every scene sequence. In addition to the flying light-bridge behind the proscenium opening, there are four battens of powerful border lights equally spaced in the depth of the stage, three rows of spotlights in the first three ceiling panels, follow-spots from the side walls of the house, tormentor lights and numerous light pockets in the stage floor for portable lamps and work-lights. Colored lighting is available, of course, with most of these lights.

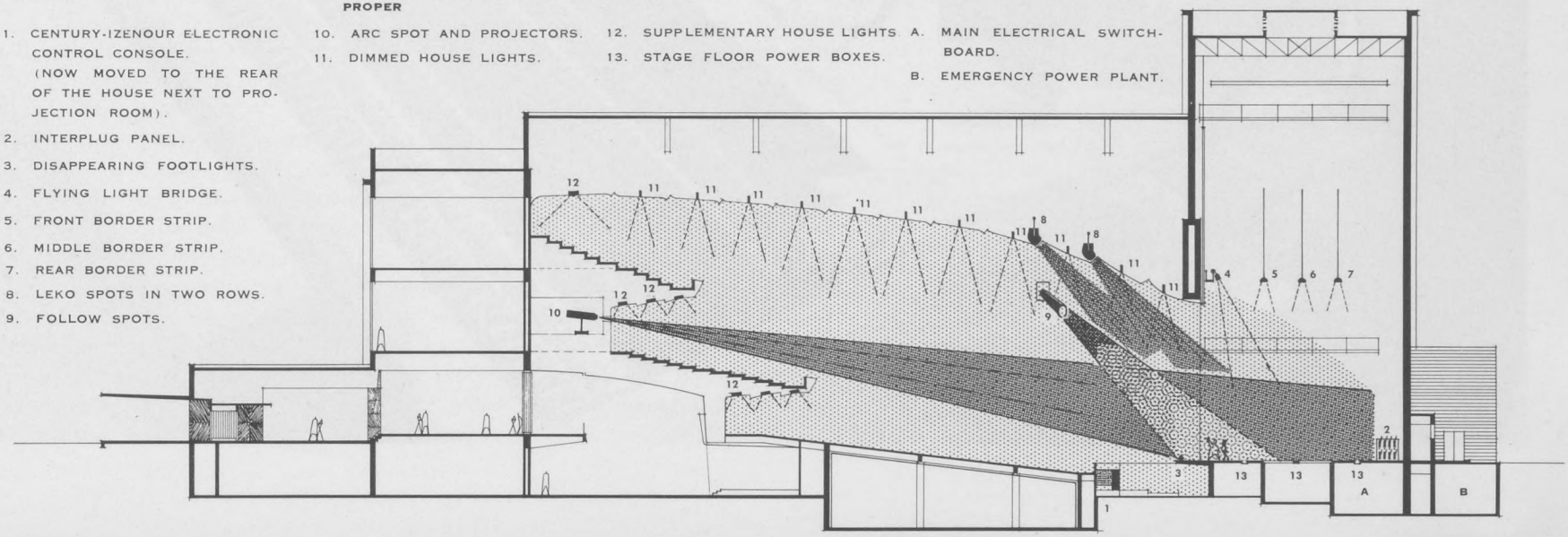
House illumination is provided by the high wattage lamps required for such high ceilings, but softened by using lamps with a narrow concentrating beam, recessed deeply in fixtures that are painted black on the inside. This device renders the light source unobtrusive and creates the impression that the subdued light of the main body of the house is coming from many softly gleaming lamps high in the sky.

SCHEMATIC DIAGRAM OF MAIN LIGHTING PROVISIONS FOR THE STAGE AND AUDITORIUM PROPER

1. CENTURY-IZENOUR ELECTRONIC CONTROL CONSOLE. (NOW MOVED TO THE REAR OF THE HOUSE NEXT TO PROJECTION ROOM).
2. INTERPLUG PANEL.
3. DISAPPEARING FOOTLIGHTS.
4. FLYING LIGHT BRIDGE.
5. FRONT BORDER STRIP.
6. MIDDLE BORDER STRIP.
7. REAR BORDER STRIP.
8. LEKO SPOTS IN TWO ROWS.
9. FOLLOW SPOTS.
10. ARC SPOT AND PROJECTORS.
11. DIMMED HOUSE LIGHTS.
12. SUPPLEMENTARY HOUSE LIGHTS
13. STAGE FLOOR POWER BOXES.

A. MAIN ELECTRICAL SWITCHBOARD.

B. EMERGENCY POWER PLANT.



The foyers and lobbies are brilliantly lit by showers of light from gracefully designed chandeliers, supplemented by the glow of random ceiling lamps set in the same inconspicuous fixtures as those used in the auditorium itself.

The main auditorium sound system is a two-channel stereophonic type with a phantom third channel; an additional group of six speakers located in the soffit under the balcony is fed through an electric delay mechanism to increase definition in this area. Speakers installed in all principal rooms, public washrooms, dressing rooms, offices, announcers' rooms and workshops carry paging and background music, when desired, throughout the building. Two three-speaker units are installed in the main social room. The conductor's room is equipped with a three-speaker unit and a high fidelity record player.

Ten microphone lines in the auditorium proper are suspended from the ceiling at the light bridge, in the footlights, in the orchestra pit and for off-stage pick-up. Including these and other outlets in principal areas, there are sixty-one microphone outlets throughout the building.

The sound control console on the Grand Circle level controls inputs and outputs from tape recording equipment, turntables, lines to television docks, two telephone lines for remote broadcast, and interconnection of all major components. It handles also such operations as switching, monitoring, loud-speaker selection, etcetera.

All important areas of the backstage rooms are serviced with inter-communication devices.

Television cameras may operate from eleven different camera positions and with views of the main stage, the rehearsal stage and the Green Room, while two 27" television sets in the main social room may pick up performances from the auditorium stage.

Broadcasting, telecasting or recording is possible from the main stage and the rehearsal stage, while single-camera telecasting may be done from the Green Room. Broadcasting and recording, monaurally or binaurally, may be done from the main social room, the banquet room, the assembly room, the exhibition area, the main lobby and the upper lobby.

Numerous electric clocks conveniently placed throughout the building are regulated by an electronic system which operates through a transmitter sending out impulses which are received by each individual clock in the building.

In case of a power failure, the electrical installation is automatically switched to an emergency battery system which supplies essential illumination, including exit lights, throughout the building.

Instructions and cues from the stage manager to performers or conductor may be relayed from backstage through the control panel to dressing rooms or the conductor's room and to many other areas in the building.

Features of the Building

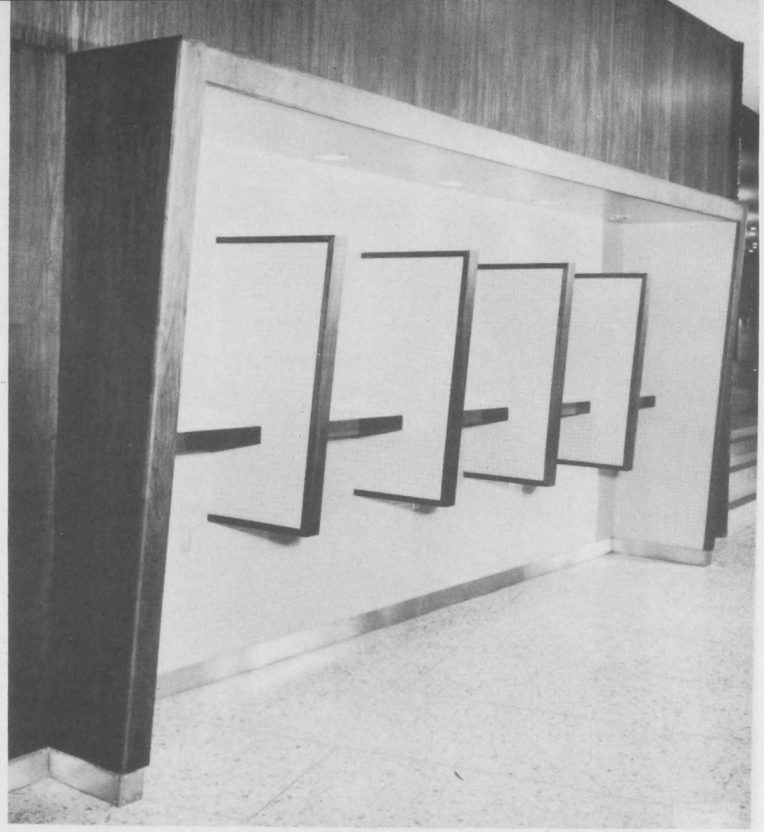
A double row of seventeen glass doors leads directly into the foyer where the gleaming surfaces of Venetian terrazzo floors, marble columns, mirror-walls and wood panelling make an immediate impression of shining newness and cleanliness. From here, all of the foyer facilities—box office, checkroom, telephones and rest rooms—are visible, and one has an open, unobstructed view of the entire main lobby and lounge. The lighting in this area, after the bright marquee lights, is somewhat subdued and intimate, affording patrons a measure of privacy in which to remove coats and prepare themselves for their debut into the stream of people meeting friends and chatting and strolling about the lobby in the prelude to the evening's performance—the arrival of the audience.

Separating the foyer from the lobby is a row of beautifully matched columns of polished red marble from Italy. Mounting three shallow steps, brightly lit and provided with a non-slip treatment for safety, one enters the spacious and luxurious lobby.

The strikingly beautiful main lobby

Upon entering the main lobby one is immediately transported from the work-a-day world into an atmosphere of luxury and graceful elegance. Yet nowhere is there in evidence the slightest suggestion of the ornate, the forced or pretentious design so often associated in the public mind with so impressive an interior. Here, it is the dignity achieved by simplicity of form, design and ornamentation, the delightful diversity of vistas from every point, the lively variations in lighting, that create the luxurious and beautiful background, actually a specially designed stage, for the colorful movement of the assembling audience.

One moves quietly, almost floating, in fact, over the rich custom-made carpet which serves also, with the acoustic ceiling, to absorb and check noise. Seven specially designed and fabricated chandeliers of polished brass shed great brilliant circles of light along the entire length of the lobby, while random-spaced lights twinkle like stars in the high ceiling. The fluted appearance of the row of round columns, which artfully reduces their apparent dimensions, is obtained by the application of walnut strips over a white glossy base. Heavy gold drapes, low, flower-filled planters, the muted pastels and deep colors of the upholstered furnishings impart warmth, while reflections in the gleaming mirror-panelled walls at either end of the lobby bring added depth and color to the whole scene.



Interesting decorative effects are achieved in the foyer area through the use of satin walnut and polished brass in an unusual screen design for the facade of the ticket office, and through the departure from conventional form seen in the phalanx of telephone booths, walled in light colored acoustic tile and placed against dark wood wall panels.

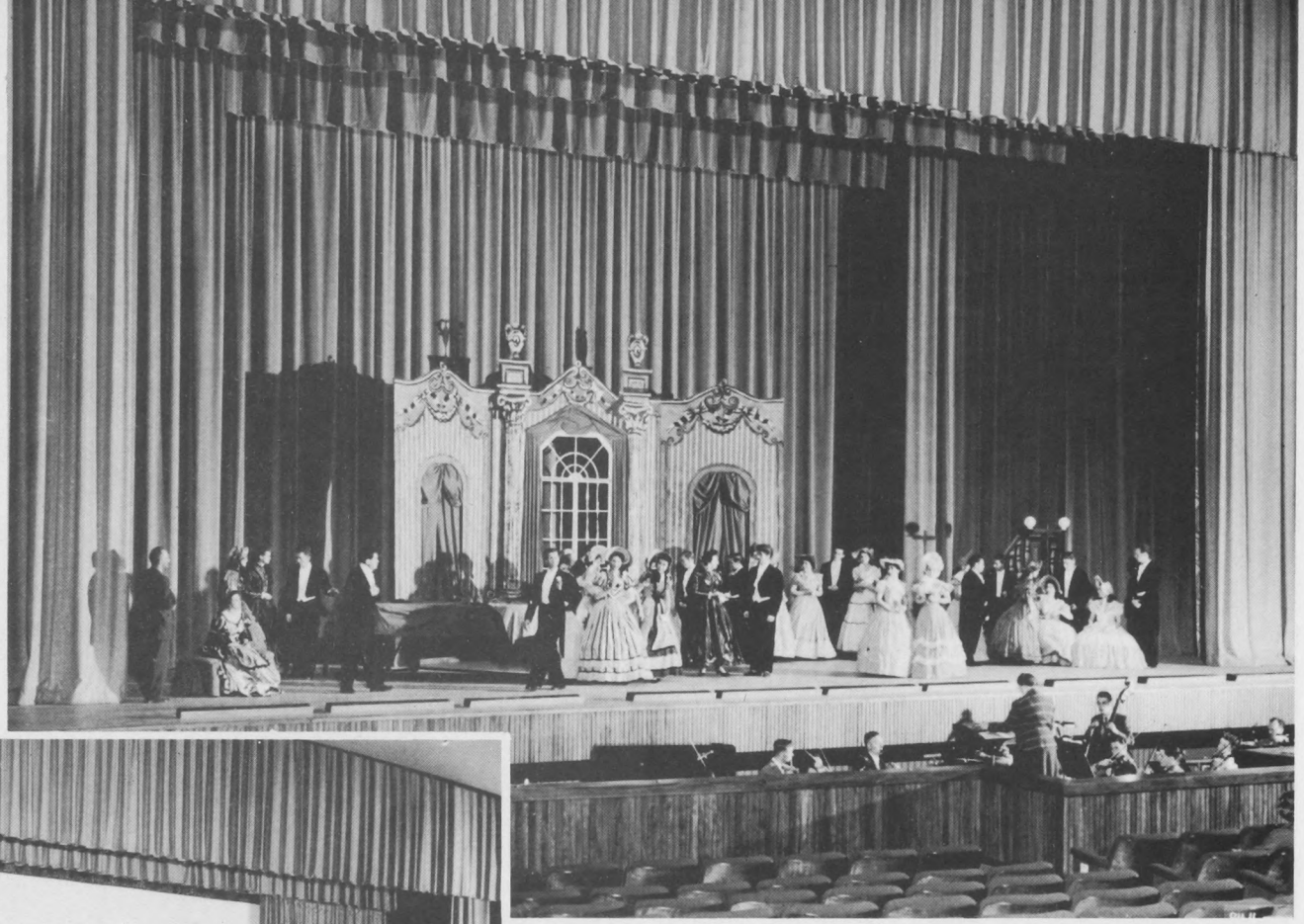
To the left of the entrance is the checkroom with facilities for handling more than 1,500 coats quickly and efficiently. An attractive arrangement of walnut fins and counters in a paced-out design across the front of the checking area makes a pleasing pattern here.

Broad stairways, sixteen feet wide, lead to the first and second balcony levels. Delicately designed handrails of brass and white enamel are set in terrazzo strips and the steps are carpeted in the same deep-pile carpeting that covers the lobby floors. Here again the ceiling lights produce a star-studded effect, while small wall-bracketed lights, reflected as pools of radiance along the natural walnut-panelled walls, create a lovely effect through variations of light intensity at different points.

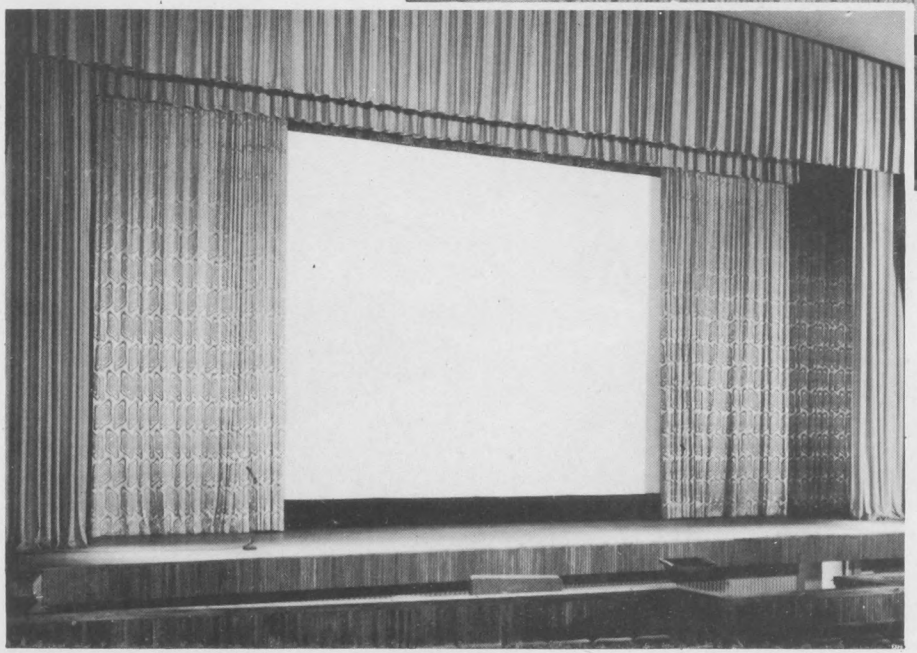
In the auditorium proper the inward-slanting walls are of polished French walnut panels set in a random pattern. The visible openings are for follow spotlights and for television and radio broadcast equipment and operators. The gently formed ceiling panels and the dramatic pattern of perforated wallboards and carpeting on the rear walls are not only attractive in design but function also, or rather function mainly, as sound reflectors diffusors and absorbers in this huge acoustic shell. Projecting out over the main seating area are the successive tiers of the Grand Circle and the Second Balcony. Aisles are carpeted and the fabrics used for the comfortable foam-rubber cushioned chairs were selected especially for their acoustic properties in relation to the acoustics of the house as a whole.

Seating capacity of the auditorium is approximately 2,750, and a special area, reached by ramps, is set aside for wheel chairs.

The Grand Circle

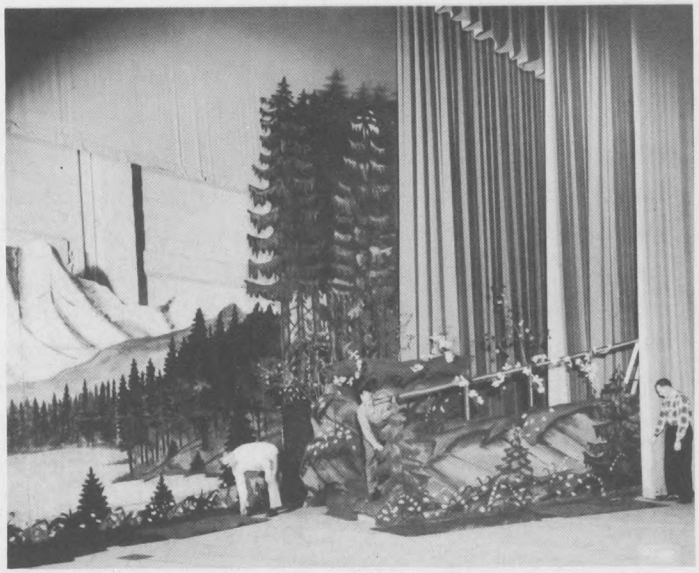


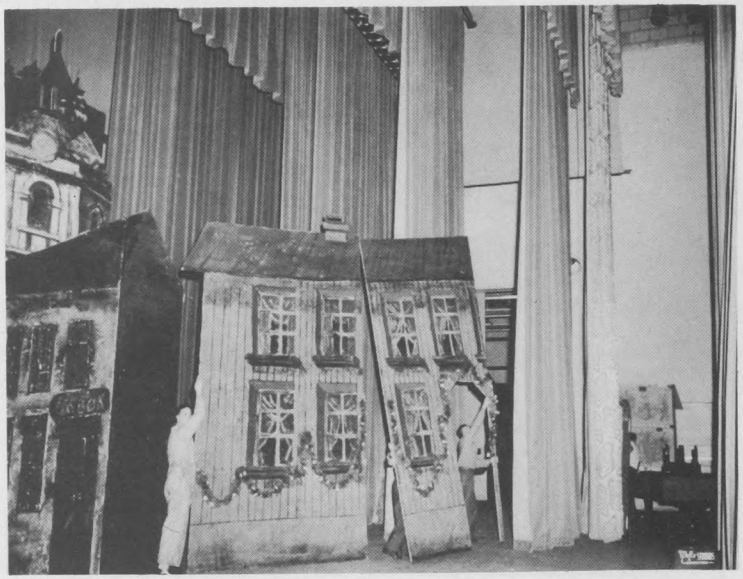
Dress rehearsal of operetta on the auditorium stage



The stage itself, though large enough to accommodate the biggest production, may be reduced, by means of draw and drop curtains, to the required size for any kind of presentation. It is fitted, also, with a large motion-picture screen suitable for movies in cyclorama and the like.

In the large workshop adjacent to the stage, scenery and equipment are fabricated and prepared for stage settings and quick scene-shifting. An electric elevator to this area brings heavy stage equipment effortlessly from the lower level workrooms and storage docks.





Scene-shifting is accomplished quickly and easily

The Edmonton Symphony Orchestra and the Civic Opera Orchestra in rehearsals

Rehearsal facilities are excellent. In addition to the auditorium stage, a large rehearsal stage, identical in size to the acting area of the main stage, is provided in a soundproofed room with extra seating space for about 100 people. Two rows of specially designed sound units on the walls at back and front of the rehearsal stage provide the required acoustic conditions for this room. A broadcast control booth at one side of the stage makes possible radio or television broadcasts, from this area. Orchestra rehearsals may, of course, be conducted in the orchestra pit. Several practice rooms are also available for concert artists.

Behind the scenes, technicians control sound amplification and operate TV cameras and broadcast equipment when necessary.

A complete sound control booth at the first balcony level is the heart of the complex auditorium sound system and the public address and intercommunication systems for the entire building.

Cameras for closed-circuit and general broadcast television production may operate through openings in the side walls of the auditorium proper.

THE ALBERTA

Jubilee Auditoriums

ERECTED BY THE
GOVERNMENT OF
THE PROVINCE OF ALBERTA
AS A TRIBUTE TO
ALBERTA'S PIONEERS
IN COMMEMORATION OF
THE PROVINCE'S
FIFTIETH ANNIVERSARY
1955 A.D

Well planned backstage facilities for production casts include spacious dressing rooms with private bathrooms for principals, commodious, well equipped dressing rooms for other cast members and chorus, fitting rooms, make-up rooms, an attractive and comfortable Green Room with bar-type kitchen, a musicians' lounge, a conductor's room, music library, and special facilities for stage manager and stage hands.

Mahogany and gumwood panelling harmonize with deep-pile carpeting and richly colored draperies in the attractively decorated traditional Green Room.

The orchestra conductor may have a last-minute look at the score or listen to a back-play of his own conducting in the privacy of the conductor's room, while members of the orchestra relax in the musicians' room.

The specially lighted exhibition area features recessed mouldings for hanging pictures, and brilliant lighting for various exhibition purposes.

Pleasant public powder rooms provide comfort and the utmost in convenience.

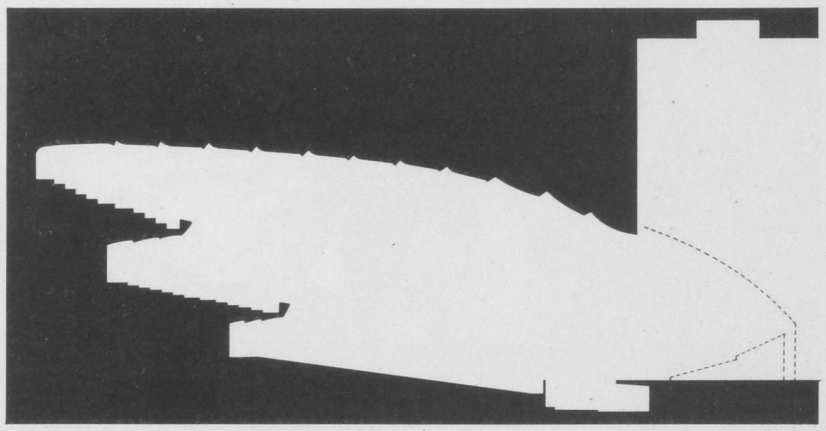
The managers of the Jubilee Auditoriums occupy attractive offices located above the stage entrance.

COMPARISON OF THE JUBILEE AUDITORIUMS WITH TWO OF THE WORLD'S MOST FAMOUS CONCERT HALLS

ALBERTA JUBILEE AUDITORIUMS

EDMONTON AND CALGARY, ALBERTA

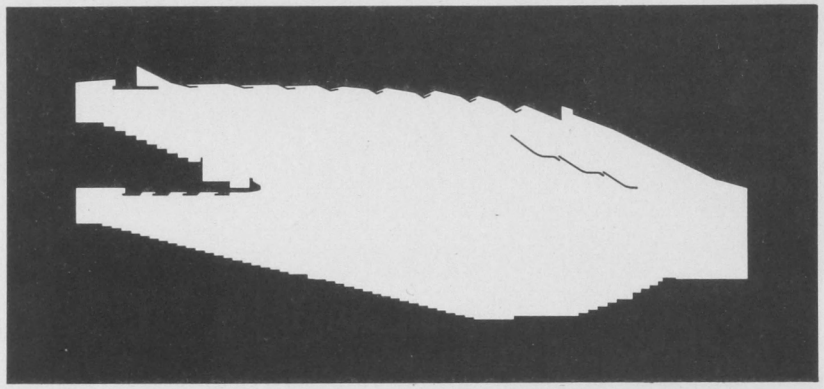
Fan-shaped. Ramped main floor. Two raked balconies. Twelve different shaped ceiling panels.



ROYAL FESTIVAL HALL

LONDON, ENGLAND

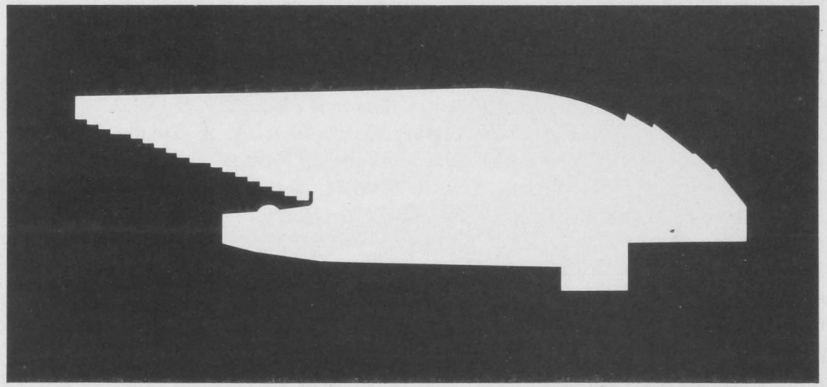
Partly fan-shaped seating area within rectangular plan. Fully raked. Stepped orchestra platform. Reflecting area in front. Suspended canopy.



KLEINHANS MUSIC HALL

BUFFALO, U.S.A.

Elliptically shaped. Sloped floor. Flat stage. One gallery.



ACOUSTIC EXPERTS AND PARTICIPANTS IN THE TEST CONCERT

Dr. H. Grayson-Smith, *Chairman, Head of Department of Physics and Professor of Physics, University of Alberta;* Dr. Vern O. Knudsen, *Vice-Chancellor, Dean of Graduate Division, Professor of Physics, University of California;* W. E. Rossman (standing), *Head of Acoustical Group, Alberta Department of Public Works;* Dr. Arnold M. Small, *Chief of Reliability, Human Factors and Acoustics, Convair, San Diego, California;* Henry Plukker, *Conductor, Calgary Philharmonic Society;* G. A. Jellinek, (standing), *Senior Architect, Alberta Department of Public Works;* Dr. Leo L. Beranek, of *Bolt, Beranek & Newman, Inc., Professor of Communication Engineering, Technical Director, Acoustical Laboratory, Massachusettes Institute of Technology, Cambridge;* Dr. H. Le Caine, *Electronic Music Group, Radio and Electrical Engineering Division, National Research Council, Ottawa;* Murray Adaskin, *Professor of Music, University of Saskatchewan;* Geoffrey Waddington, *Director of Music, Canadian Broadcasting Corporation;* A. B. Steinbrecher (standing), *Senior Project Architect and Member of Acoustical Group, Alberta Department of Public Works;* Dr. Arnold Walter, *Director, Faculty of Music, University of Toronto, and Professor of Music, Royal College of Music, Toronto;* Dr. T. D. Northwood, *Building Physics Section, National Research Council, Ottawa;* J. E. Plewes, (standing), *General Manager of the Auditoriums, Alberta Department of Economic Affairs;* Dr. Cyril M. Harris, *Director of Electronics Research Laboratories and Professor of Electrical Engineering, Columbia University, New York;* Dr. Michael Rettinger, *Engineering Products Division, Radio Corporation of America, Hollywood.* Not pictured: Dr. N. H. Grace, *Director, Research Council of Alberta;* R. S. Eaton, *Head of Music Division and Professor of Music, University of Alberta;* R. Clarke, *Chief Architect, Alberta Department of Public Works;* M. F. Fayers, *Engineer and Member of Acoustical Group, Alberta Department of Public Works;* H. A. Spencer *Industrial Engineer, Research Council of Alberta;* E. F. Stevens, *Building Physics Section, National Research Council, Ottawa;* C. E. Till, *Prairie Regional Laboratory, Division of Buildings Research, National Research Council;* D. M. Beaupre, *Electronics Engineer, Canadian Electronics Ltd.;* W. H. Kaasa, *Co-ordinator of Cultural Activities, Alberta Department of Economic Affairs;* Dr. Leslie Bell, *Leslie Bell Singers, Inc.*

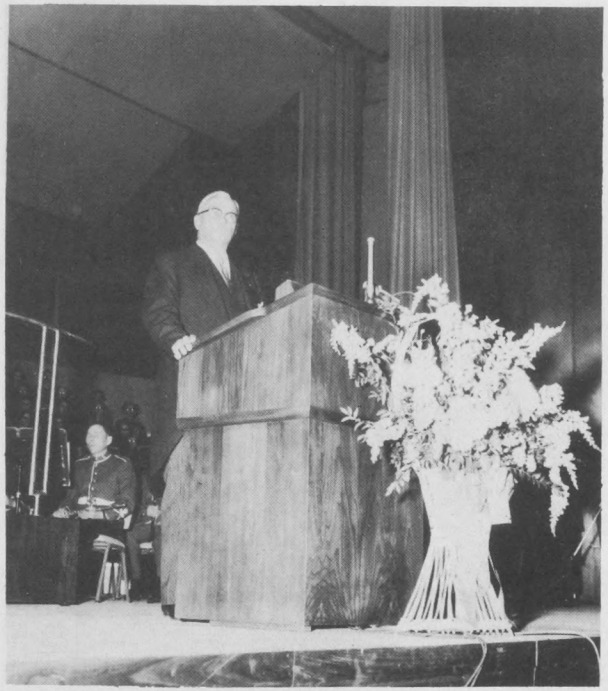
Acoustical Test

On the morning of April 8, 1957, twelve acoustical and musical experts from all parts of the North American continent gathered with the acoustical team, 100 professional musicians and 1,600 concertgoers and music students for the final acoustical test of the Northern Alberta Jubilee Auditorium. A three-hour test concert performed by a 100-piece symphony orchestra, a choir of 180 voices and a solo violin, in a program of music which offered a wide range of sound effects, was carefully auditioned and scored by the audience of qualified judges.

The results were gratifying indeed. The acoustical authorities agreed that this was one of the world's great concert halls, comparing it most favorably with a number of the most acoustically perfect halls now in existence.

In accordance with suggestions made by this panel of experts, and with observations made during the succeeding months, several minor adjustments have since been carried out to further improve the acoustical quality of the two auditoriums for every type of performance likely to be heard within their walls.

Premier Manning receives the gold key to the auditorium from the Honourable James Hartley, Minister of Public Works, accepting it in the name of Alberta's pioneers.



Lieutenant-Governor J. J. Bowlen addresses the audience at the official dedication ceremonies.

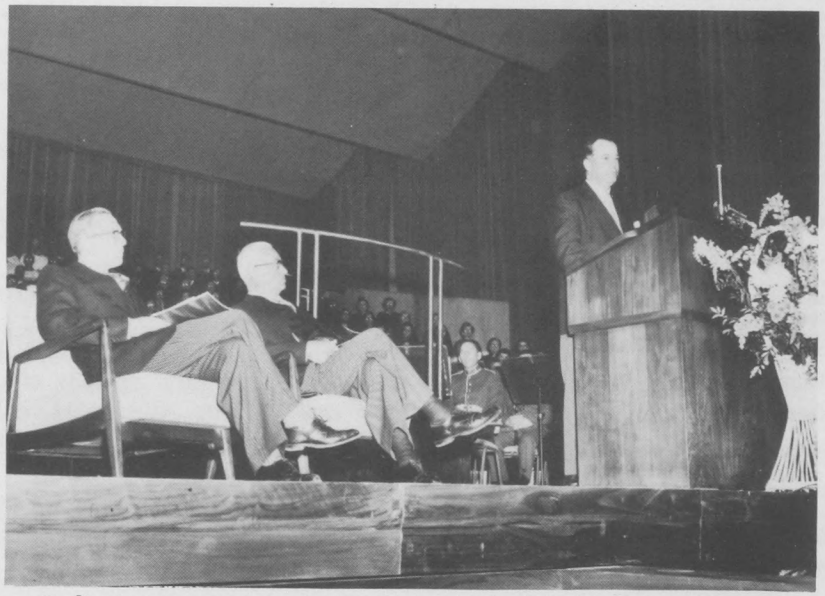
Colorful dedication ceremonies were witnessed by a capacity audience in both the Northern and Southern Jubilee Auditoriums.

Official Dedication

Both auditoriums were officially dedicated on Sunday, April 28, 1957, in colorful ceremonies in which capacity houses of Alberta citizens participated. Premier E. C. Manning and Lieutenant-Governor J. J. Bowlen took part in both dedication programs, while Mayor William Hawrelak of Edmonton and Mayor Don McKay of Calgary welcomed the public to the auditoriums in their respective cities.

The official dedication of the two auditoriums was followed by a full week of symphony, ballet, drama, pageant, opera and variety musical programs especially arranged for this dedication week.

Dedication ceremony at the Northern Jubilee Auditorium in Edmonton.



Dedication ceremony at the Southern Jubilee Auditorium in Calgary.

Schedule of Accommodation

PRELIMINARY DESIGN

A. AUDITORIUM C. SERVICE KITCHEN

B. SOCIAL ROOMS D. ENGINEERING SERVICES

E. CAR PARKING

A. AUDITORIUM

1. Public Circulation and the Auditorium Proper.
2. Stage and Back Stage Management.
3. Orchestra and Musicians' Suite.
4. House Manager and Maintenance Staff.
5. Special Miscellaneous Accommodation.

1. (a) PUBLIC CIRCULATION

Main Entrance - - - - - - two sets of single swing-out doors.

Main Foyer - - - - - - - - access to all parts of the auditorium and the social rooms.

Ticket Office - - - - - - - adjacent to entrance and cloaks with wicket for advance sale.

Booking Office - - - - - - with plans of seating, publicity arrangements, racks of "hand-outs", clock and telephone.

Exits - - - - - - - - - - - double cut-off doors.

Cloaks - - - - - - - - - - on main foyer level only.

Lavatories - - - - - - - - - on main foyer level only.

Refreshment Counters - - - for service of hot and cold beverages, ice cream, candies, etc., lock-up walk-in cooler, dumb-waiter for service kitchen.

Provisions for Floral Decorations.

Seats in Sunken Foyer.

Promenade corridors - - - at both sides of the rear part of the auditorium only, damped acoustically, ventilated, equipped with signals, clocks, signs.

Signals - - - - - - - - - - call bells synchronized with back stage bells, located in foyers, lobby, lavatories.

Loud Speakers - - - - - - for public announcements in foyers and entrance vestibule.

Outlets for Vacuum Cleaning and Polishing.

(b) AUDITORIUM

Audience approximately	2,800	seated including wheel chairs
Audience approximately	80	standing
Audience approximately	110	additional seats on raised orchestra platforms
	Total 2,990	

Sight lines arranged (raked or stepped for rear stalls and balcony, and floor slope for front stalls) to give clear visibility of performers.

Boxes or blisters for broadcasting commentators, spot lights, and stage lighting controls. Provisions for television equipment.

Trapdoors in ceiling for microphones or other special equipment.

Illuminated clocks.

Cushioning of padded leather or equal for sound absorption around the entrances of the auditorium.

Outlets for vacuum cleaning. Central vacuum plant for noiseless operation during rehearsals, etc., preferred.

Concealed firehose cabinets.

Front of orchestra pit and front seats to have pronounced curve.

Controls of stage and general lighting of the house from central board.

All seating to be permanent and wired with aids to hearing (telesonic system).

Clear sight lines of all performers. Staggered seats.

Loud Speakers for managerial announcements.

Smoking to be anticipated. No observations on ventilation.

Temperature to be constant. 67°F to 70°F optimum. Humidity approximately 40 - 50%.

Supply of fresh sterile air about 10 c.f.m. per person.

Conditioned air blown into the auditorium through ceiling grilles, and exhausted out of the house by means of mushrooms under the seats to a plenum chamber. Twenty per cent fresh outside air will suffice to re-establish an adequate oxygen content.

Air heated in winter time by a radiator in the main air duct, steam coil fed from the boiler. Cooling of the air in the summer by means of city water run through the cold coil (if it does not get warmer than 65°F.)

Air sterilization by adding 1 ounce of glycol per hour to 3,000 c.f.m. of air.

Dust removal by filters.

Controls for the air conditioning system are the conventional thermostat and humidistat located in the house at the average audience elevation.

All ducts must be absolutely silent and insulated, and the air should be moved at low speeds.

Balcony to have minimum overhang.
Concealed tubular curtain rail at under-edge of balcony to be provided.

Orchestra canopy suspended from the ceiling in front of proscenium.

Warm and preferably strong color note to be present and could be provided by upholstery, carpets, fabrics at walls and curtains.

Auditorium straw-color lighting to be concealed and diffused except for post light and any minor shaded, colored wall or balcony front bracket lighting.

2. (a) Stage

Stage kept horizontal and 3' 6" to 3' 8" above the floor level at the first row.

Provisions for forming of a forestage over the orchestra pit by means of adjustable platforms.

Removable stepped tiers for choir and band arrangements. Risers 8" to 9". Sockets for desks at 12" o.c.

Adjustable rostrum for conductor and speaker.

Orchestra of 60 to 80, approximately 50% strings.

Arrangements to move piano and heavy instruments direct to instrument store. Thermostatically controlled space for harp and 2 concert grand pianos in the store.

Organ console optional.

Orchestra entrances under the stage.

Disappearing microphones for speakers.

Apron stage as an acoustic reflector for overspill of orchestra, soloists, etc., when a mass choir is engaged.

Choir of 100 to 150.

Provisions for floral decorations.

Conductor to be visible by every performer from waist upwards. Adjustable desk wired for concealed inter-communication (and warning lights and pushes?)

Spot lights or floods for conductor and soloists.

Orchestra generally will rely on concealed diffused lighting with no desk lights except for timpani, percussion and possibly organist, but straw color lighting should be stronger than for audience and from side sources and not from above. Special floodlights over the stage should provide sufficient intensity of lighting of performances and functions to be televised.

Disappearing footlights. Special floor-lighting effects for the rear wall of stage (or cyclorama). Moveable cyclorama as scenic background and as a sound reflector.

Spotlights in light slots at both sides of the proscenium opening.

Stage to have maximum massive timber construction for resonance.

Ample 110v outlets for broadcasting. (Pick-up points for cameras).

Two hose lines and two pipe stands on each floor of backstage.

A water tank on top of the stage house.

A perforated water pipe across the proscenium opening with hand operated valve near the stage floor.

An asbestos curtain and the act curtain should be of the fly action type.

Sprinkler system for the stage, in scene docks, shops, trap room, in basement rooms under the stage.

Water connections and drains on stage, drains in the trap room for water effects.

All piping to the dressing rooms and shops to be hung in basement corridors, etc. Color-coding of pipes is distinctly advantageous.

A set of traps at rear of the acting area of the stage.

(b) Back Stage Management

Stage entrance with small vestibule (clock, warning lights, waiting space, telephone.)

Doorkeeper's office giving control over entrance and main circulation corridors behind the stage (clock, telephone, fire alarm bells, warning lights, direct line to Fire Brigade, speaker inter-communication set.)

All access for maintenance staff and performers from the street to back stage except loading dock past the Stage Doorkeeper.

Stage Manager's general office and conference room for board of directors with toilet facilities adjacent to Doorman's office. Smaller office on stage. With clocks inter-communication sets, bells, lights, etc.

Loading platforms with canopy over the overhead door, 10' x 12' 6" in height, ample to take concert grands and boxed instruments. Width of platform for two vans.

Large freight elevator from stage floor level to stores below with platform ample to carry 9' 6" concert grand pianos.

Covered dock for 2 movable radio and TV units with access to stage and commentator's booth.

Power requirements for the units: total 2kw, 110v.

All heavy electrical equipment such as transformers, motors, cables, etc., should be kept away from radio and TV areas.

Large workshops with paint shop adjacent to loading platform and freight elevator. Clock, telephone, speaker and lights.

Sound insulated sliding panel partitions dividing side stage from workshops.

Rehearsal room for 120-150 artists, well soundproofed, could be available for recording purposes and to private musical societies for performances, lectures, chamber music etc.

Three small practice rooms, one with upright grand and each with mechanical "A".

Instrument store immediately off orchestra pit with easy access to elevator, designed to take the largest instrument and shielded from outside humidity and temperatures. The store should hold two sets of the following instruments:

3-4 timpani	1 gong
1 bell	1 set of percussion
1 bass drum	1 vibrophone
6 double bass	1 harp
8-10 celli	4 hampers of smaller instruments.
8 horns	
3-4 trombones	

The harp, together with two 9' 6" concert grand pianos, should be screened or partitioned off in a thermostatically controlled space which together with the main instrument store, must be of the same temperature as the auditorium. In the store there should be a telephone, speaker and lights.

Stage hands' lounge with two sets of lockers for each 16-20 men and toilet facilities for stage hands and craftsmen. Clock, telephone, speaker and warning light.

Costume shop for fitting, repair, storage; with dumbwaiter to quick change room and dressing rooms on stage floor level. Telephone, clock, speaker and warning lights.

Trap room below rear of acting stage with floor drains, lights, speaker.

Scenery storage, properties' store, designer's studio near elevator. Telephone, lights or bells, speaker.

General storage room for scenery etc., below front stalls of auditorium with easy access to elevator. Warning lights, speaker.

3. Actors' and Musicians' Suite

Actors section to be self contained in the sense that its corridor is not used as a thoroughfare for other sections; located at same level as and having immediate access to stage. Planned so that it is under supervision of Stage Manager and, or Stage Steward.

Dressing rooms for 60 artists, (50 per cent men and ladies) with toilet facilities, a few full length mirrors, tables with mirrors and lights, wardrobe cupboards or clothes racks, settees, clocks, telephone, speaker, warning lights, mechanical "A".

Artists' Lounge—Green Room with snack bar, equipped with Red Cross cupboard, with communication doors to actors' dressing rooms and stage and to the auditorium. With tables, settees, clock, warning light, telephone, speaker. Could be used for interviews, conferences, etc.

The Soloists' and Choir's Dressing Rooms and Lounge are in the basement under the actors' section, equipped with clothes racks, dressing benches, mirrors and lights, some full lengh mirrors, clock, telephone, speaker and bells or warning lights, mechanical "A", seats or benches, space for instruments, thermostatic control (-auditorium).

Small Conductors' Compartment with washbasin, W.C., full length mirror, table, settee.

Library and Conductors' Rest Room with shelving for scores, card index, sorting and stacking bench, clock, telephone, speaker and bells or warning lights. Full length mirror, table, settee, radiogram, provision for television set.

Vault or safe for precious copies and manuscripts.

4. House Manager and Maintenance Staff

Under House Manager's control are all rooms described under section 1. a. "Public Circulation". His office should be close to the entrance and could form a part of the ticket office or booking hall.

The functions of the House Manager are carried out by:

a secretary,

the accountant and the ticket office staff,

the chief steward and the house stewards, and a number of janitors or cleaners.

A first aid and rest room should be provided for the convenience of the audience and equipped with Red Cross cupboard, wheel chair, examination bench, table, settees, telephone, hot and cold water, oxygen.

Safe for personal and lost property.

5. Special Miscellaneous Accommodation

Exhibition space at entrances, in lower and upper lobbies, along balcony gallery etc., with moveable panels for exhibits; frames and show cases for pictures, displays, etc.

Brilliant light.

B. SOCIAL ROOMS

With access from the main foyer through the sunken lobby are provided two smaller halls divided by a folding partition between them and glazed in from three sides. These rooms with a total capacity of approximately 650 persons are designed primarily for different social events, lectures, activities of country organizations etc., and they are equipped with a television set and public address system to allow the overflow of the audience to follow the performances on the stage of the auditorium. A raised platform and a refreshment counter are incorporated under the overhang of the sunken lobby floor.

The rooms to have sets of moveable chairs, a number of small tables, settees, inter-communication, warning lights, telephones, a revolving colored illuminated sphere for ballroom lighting effects, provisions for small film demonstrations, etc.

Storage space for storage of chairs, etc., to be provided adjacent to these rooms.

C. SERVICE KITCHEN

A service kitchen with a separate entrance, vestibule, coat hanger space, toilet facilities for both sexes, storage space and a walk-in cooler, and a servery to be provided for serving refreshments and sandwiches to the sunken lobby and the social rooms.

The kitchen and/or servery to be equipped with electric service lifts or dumbwaiters, electrically heated hot plates, and cupboards, and cafe sets, meat slicers, glass and dish washers, refrigerators, etc.

D. ENGINEERING SERVICES

The mechanical plant, entirely separated from the rest of the building by means of "absolute fire separation", providing an effective resistance to the passage of fire for not less than four hours, and including:

(a) the boiler room for a number of individual heating plants in order to avoid wasteful operation having regard to the possibility of the whole of the building not being in use at the same time.

(b) the central hot water system consisting of a gas fired hot water heating boiler with a copper storage cylinder and a distribution system serving lavatories and cleaners' sinks throughout the building.

(c) the necessary motors, pumps, vacuum cleaning systems, controls and switches, meters, etc., to feed the heating system or to discharge the wastes into the main sewer system. All pumps, motors, etc., must be silent.

(d) the electrical vault for transformers and equipment with an emergency power supply from a source entirely separate from the regular one.

The auditorium should be heated by circulation of filtered, washed and warmed air through the ventilation system, all under thermostatic control. The ventilating chamber with heating and cooling coils should be on top of the stage house.

The dressing rooms and other comparatively small rooms may have separate ventilating systems (noise reduction).

Other separate extract systems to be installed to deal with the lounge, social rooms, service kitchen and ranges of lavatories.

Provisions for a garbage burner should be made.

Special installations as follows:

(a) Electronic tuning fork (mechanical "A") to the orchestra pit and artist's rooms.

(b) Loud speakers incorporated in reflectors above forestage to serve the public address system, in corridors, foyers, lobby, social rooms, lavatories, dressing rooms for the artists.

(c) Fully automatic internal telephone installation and a comprehensive bell and lamp indicator signal system for inter-communication.

(d) Master impulse clock system operating slave clocks throughout the building.

(e) Automatic fire detectors with an indicator at the central point to show the location of any break. The alarm is given by a bell and by direct telephone to the Fire Brigade.

(f) Burglar alarm in booking and ticket offices.

(g) The broadcasting commentator's room, stage, auditorium, the Green Room and the rehearsal room are served by conduits to suit cables of broadcasting companies. Facilities should also be provided for suspending microphones in the body of the auditorium.

E. CAR PARKING

Parking space should be provided for 25% to 33% as many cars as there are seats in the house.

The unloading curb to be provided as long as possible with a two-lane-wide driveway and a sidewalk not less than 10' wide covered by a marquee at full length, or at least in front of the entrances.

One-way traffic preferable.

Light on parking lots, under marquee and at entrances adequate for general lighting and for decorative highlighting of special areas.

ELECTRICAL EQUIPMENT FOR INSTALLATION

INTERCOMMUNICATION

For co-ordinating activities of the theatre.

Transmitting of cues to various parts of stage, trap room, projection booth, etc., dressing rooms.

REQUIREMENTS

Central for preference and rehearsal to be at Stage Manager's station. Stage Manager must communicate

By voice or cue to:

(a) Opposite Side of Stage
(b) Fly Gallery
(c) The Trap Room
(d) The Switchboard
(e) The Orchestra
(f) Spotting Booth
(g) Projection Room
(h) Sound Control Station.

By voice only to:

(a) Dressing Rooms
(b) Green Room
(c) Box Office
(d) The Shops
(e) Offices
(f) Outside telephone switchboard (if required.)

STAGE TELEPHONE

A talk-back loudspeaking telephone can be used on stage and at stations where it can be heard from stage, during assembly, lighting and rehearsal. A microphone extension to be provided for directing performances. For cues, a loudspeaking telephone system will be hooked up to stage microphones during performances. All communication systems to be equipped with the automatic volume. Provisions for plugging one of the telephone loudspeaker systems in head and chest sets, be made for quiet operation.

System of cueing.
Position of units.

Two systems:

1. Light system, pilot light, color added.
2. P.A.

LOCATION

(a) **Opposite prompt side of stage—** Telephone call light, cue light, and cue acknowledgement key, loudspeaker for assembly.

(b) **Fly Gallery—** same as opposite prompt (OP).

(c) **Trap Room**—same as opposite prompt—plus a click signal on the cue light and telephone call.

(d) **Switchboard—** same as OP.

(e) **Orchestra—** same as OP.

(f) **Spotting booth** and all house spots locations—same as trap room.

(g) **Projection Room—** same as trap room, plus outside telephone.

(h) **Sound Control—** same as trap room.

(i) **Dressing Rooms—** talk-back loudspeaker, telephone, one built into wall between every pair of dressing rooms. Talk-back button in each room.

(j) **Green Room—** talk-back loudspeaking telephones plus outside telephones.

(k) **Box Office - other offices—**telephone with buzzer call plus burglar alarm system.

(l) **Shops—** same as trap room.
(m) **Foyer—** public telephones for outside use.

All talk-back telephones to be pilot lighted at Stage Manager's Station.

Lights must be associated with keys and keys must return to open position when released. Stage manager may cut microphone and loudspeakers, and substitute a telephone handset during performances.

Amplifiers must be simply rigged and accessible, Class B adequate.

All switch keys to be silent. Mercury switches.

MICROPHONES

To have flat frequency characteristics from 30 cps to at least 10 kc and useful response to 16kc, preferably of adjustable directional characteristics.

Adjustable for unidirectional pickup.

Frequency response must be substantially unchanged when used for distant pickup and for close talk.

REPRODUCER

Magnetic tape reproducers to have flat frequency response 30 - 10,000 cycles.

Turntable to be driven by a synchronous motor.

To take 16 inch diameter discs.

To operate on both laterally and vertically cut discs by switch adjustment.

VOLTAGE AMPLIFIERS

Self-contained and include its own power supply line operating from 120 volt 60 cycle commercial line.

Gain at 1,000 cycles to be approximately 80 db.

Gain to be adjusted by remote type volume control of such design that it may be operated without frequency discrimination or noise pick-up at 1,000 ft. from amplifier.

Undistorted output to be at least 0.3 watt with a maximum output noise level of 40 db, below 6 milliwatts.

Useful frequency range shall be from 30 to 16,000 cycles.

To be equipped with frequency equalizer between tubes.

Frequency equalizer to raise or lower the low frequency end of audio spectrum to extent of 15 db in each direction at 30 cycles to raise or lower to extent of 15 db in each direction at 6,000; 8,000; 12,000 and 16,000 cycles.

INPUT CONTROL

To be mounted on 1/8" steel panel, 19" x 12¼".

To contain circuit which transfers output of any or all of the voltage amplifiers to any of three channels.

Channels to be color-coded.

Panel to contain 4 volume controls connected to outputs of 4 voltage amplifiers. Controls to be "T" or ladder attenuators with vertical movement, 600 ohms to 600 ohms.

FREQUENCY DISCRIMINATION FILTER

To consist of series of nine band rejection filters as follows:—

30 — 65; 65 — 125; 125 — 250; 250 — 500; 500 — 1,000; 1,000 — 2,000; 2,000 — 4,000; 4,000 — 8,000; 8,000 — 16,000 all in cycles per second.

Minimum attenuation in any one band to be approximately:

at centre of band, 40db.
40% above and 30% below centre, 35 db.
54% above and 35% below centre, 7 db.

POWER AMPLIFIERS

Each power amplifier to be self-contained with its own voltage supply, to operate from the 120 volt commercial alternating current mains.

Amplifier when used in a bridging connection across a 600 ohm line, to have a gain of approximately 50 db.

Output power to be 50 watts with less than 5% total harmonic distortion, or 25 watts with less than 1% harmonic distortion.

Unweighted output noise level to be 25 db or better below 6 milliwatts.

SPEAKER SWITCHING PANEL

To contain a circuit using 6 sets of switches having 10 push-buttons each.

To provide means of switching approximately 10 loudspeakers to any of 6 power amplifiers.

LOUD SPEAKERS

Consists of two parts:

1. Low frequency speaker.
2. High frequency speaker.

Level of the high frequency speaker to be adjustable in 4 steps of 2 db each.

Speakers to have permanent magnetic field.

Useful frequency range 35 — 18,000 cycles.

Overall dimension to be no larger than 33" x 33" x 31".

SOUND CONTROL BOOTH

Control System

Consists of two parts:

1. Input mixing panel.
2. Output mixing panel.

Appropriate provision for input and speaker switching on either side.

All electronic equipment is located at this point except where very long microphone lines are necessary, voltage amplifiers must be located close to microphone position (on a shelf in proscenium splay or on the stage wall) and the control circuit carried to console.

Standard radio wiring practice satisfactory for sound installation.

Provision to be made (if possible) to carry microphone lines down one side of the house and speaker lines down the other side.

Microphone lines to be kept as far as possible from electric motors, power lines, power transformers, motor generators.

Microphone cable to connect microphone to outlet should not be made up in lengths of more than 25 ft. For flexibility all input lines to be made identical and equipped with identical connectors.

Speaker outlets equipped with female twist lock connectors.

There must be a single ground for all electronic equipment.

OFFSTAGE PICKUPS

Offstage microphone connections necessary for all sound originating on stage but not in acting area. Two to three on either side.

Pick-up apparatus located in sound control booth.

PICKUPS FOR SOUND REINFORCEMENT

Provision for large number (number to be determined) of pickups on stage and in orchestra pit. Provision made for microphone connection over stage, in auditorium ceiling, in footlights and in orchestra pit.

DUBBING

For producing sound in location other than source. One speaker on each side of acting area, and one for every 15' of proscenium opening for each signal channel at each useful elevation above stage floor. Work to one series of outlets in flies.

PUBLIC ADDRESS SYSTEM

From Stage Manager's position
To: Foyer, Lobby, Lounge, Public and Social Rooms, Conveniences, Changing Rooms, Stores, Green Room and House.

STAGE MACHINERY

OUTRIGGERS

Placed over sidewall elements of a counterweight system between 10' and 20' from floor.

PIPE FRAMES

Set on stage floor. For stocking of flat scenery.

CASTERING SYSTEM

All heavy scenery to be equipped with castering units.

STAGE TRAPS

In design of stage floor, trap system shall be provided.

FIXED TRAP ELEVATORS WITH MANUAL LIFT SYSTEM

Each trap to rest on two vertical frames set in vertical tracks. Frames can be raised together to produce a level platform or singly to form a slope floor across stage. Frames held at desired heights by steel pins or ratchets engaging tracks. At maximum height elevating frames must engage vertical guides for about ⅓ of their height to insure stability of raised level. Height of understage space must be 1½ times the height of maximum raised level. Useful heights rarely exceed 10 feet.

Stage machinery in the fliers.

Gridiron, loading platform, head block beams, fly galleries, pin rails, working galleries.

GRIDIRON

Open work floor of steel placed under room of stage, on which sheaves may be fastened, and through which ropes, wire or hemp will be dropped for suspension of scenery, lighting equipment, actors, etc. Minimum headroom 6' under lowest roof girder. Stage lift blocks equipped with fastenings for sheaves. It is essential that ropes be dropped from maximum number of positions.

Standard steel gridirons consist of 1½" x 3" channels laid web-up 3" apart, on 6" or 8" channels (web vertical) and afford slightly less than 50% open space. Allowing location of spot lines (rope through gridiron) never more than 1½" from desired position.

SYSTEM FOR FLYING SCENERY

To consist of pipe batten, 3 or more wire ropes, loft blocks for each rope, head block, counterweight carriage, floor block or tension block, operating line and rope lock.

COUNTERWEIGHT SYSTEM

Pipe batten hung horizontally on wire ropes, carried up to and over loft blocks, across gridiron, to and through head block, and down to top of counterweight carriage and fastened by chains or turnbuckles adjustable for levelling off the batten.

Counterweight carriage to run up and down sidewall, a distance equal to vertical run of batten. It will be guided by wire guides attached to head block I-beams, and the floor, or by T-section steel tracks fastened to angle steel crossbars on wall.

SNAP CHAINS

Furnished on each pipe batten in sufficient numbers to permit supporting scenery at intervals of about 10'.

WIRE GUIDES

Stretched between head blocks and floor.

FLY GALLERY

Steel or reinforced concrete, bracketed to or cantilevered out from wall on both sides of the stage. Width of 6 feet, height between 10-20 feet above stage floor.

PINRAIL

Steel pipe 3½" inside diameter fastened to stanchions at onstage edge of fly gallery at height of approximately 3'. Through holes in this pipe, steel or hickory belaying pins are set vertically.

Upward stress to withstand minimum 500 lbs. per linear foot.

LOADING PLATFORM

Steel gallery approximately 2'6" wide hung between gridiron, and head block I-beams, below level of gridiron. Platform opens on counterweight side and protected by railing on stage side. Access by ladder.

HEAD BLOCK BEAMS

Parallel I-beams set 2'6" or 3' above level of gridiron near sidewall.

FLYING EQUIPMENT OVER STORAGE SPACE

Steel pipes hung under ceiling to which blocks may be tied where and when needed. A short pipe for head blocks and a short pinrail at the floor or on a gallery.

HEIGHTS

Optimum height of the space for flying must be slightly more than twice the highest scenery.

PERMANENTLY INSTALLED EQUIPMENT WHICH IS HUNG

To be hung on regular units of flying system:

1. Fire curtain.
2. Act curtain.
3. Light bridges.
4. Teaser & Tormentors.
5. Light battens.
6. Cycloramas.
7. Part or all of minor Proscenium or Portal.

FIRE CURTAIN

See Building Code and By-Laws.

Flexible asbestos cloth made of wire woven asbestos cloth of approved weight, tensile strength, and fire resistive rating. Stretched between top and bottom of steel pipe battens, hung on wire ropes, number of spacing according to code, and permanently counterweighted with just less than enough weight to balance it. Wire ropes to be larger than in counterweight system to give added safety factor. Loft block and head blocks larger than those in the counterweight system and mounted either on gridiron or in special channel brackets set into proscenium wall. Head block of parallel type, with groove for operating line. Grooves rather at side of wire rope than in center as in counterweight system.

Counterweight carriage and track as lattice type, located on proscenium wall as close to side of opening as conveniently possible. Track lay enough to allow a run of counterweight equal to run of bottom of curtain (at least equal to height of proscenium opening.)

Safety devices pertinent to asbestos curtain are:

1. **Release line**—secures curtain in high position, released by cutting, or melting of fusible links. Placed in 3 or more strategic positions.
2. **Check chains**—attached to gridiron and to top battens of curtain. Holds top of curtain above proscenium opening.
3. **Hydraulic curtain check**—reduced downward speed of curtain during the last few feet of descent.
4. **Guide wires**—ensure straight running of curtain.
5. **Electrical equipment**—for running curtain, with switch located at managers station and for electrical console.

ACT CURTAIN

Separates stage from auditorium. Operation must be smooth and simple, and its appearance pleasant.

Method of hanging and using to be determined.

PROSCENIUM FRAMING EQUIPMENT

For varying of height and width of proscenium.

Cloth Teaser and Tormentors

Teaser—hung across top of proscenium, attached to pipe batten and rigged to fly.

Tormentors—two tall narrow draperies, hung from short transverse tracks, and rigged to draw at sides of proscenium. Lighting position and or stage apparatus well above bottom edge of teaser, and well off forestage from edges of tormentors in order to be concealed.

Both teaser and tormentors can be of a framed structure, of lightweight wood or metal covered with fabric or rigid sheet material. Framed teaser may be made an integral part of flying light bridge and framed tormentors developed into tormentor light towers.

OVERHEAD LIGHT BATTENS

Curtain battens of counterweight system to be selected as light battens, and equipped with counterweight carriages large enough to balance heavy loads of lighting equipment. Must be fitted with power outlets fed by multi-conductor cables suspended from gridiron.

FLYING LIGHT BRIDGE

Constructed of steel suspended from wire ropes, counterweighted and rigged to fly. Facilities to be provided for lowering to stage floor for loading purposes. Access to bridge either by rope or ladder from stage floor, or by side galleries connecting with fly gallery.

LIGHTING AND ELECTRONIC SYSTEM

EXTERNAL Driveways and car parks

1. **Flood Lighting**
   Use approximately 15 k.w. lamps for 20 f.c.

2. **Display Frames**
   Concealed slim-line fluorescent tubes for each display frame (approx. 12 display frames.)

3. **Marquee**
   10 f.c. to 25 f.c. Lighting to clearly show entrance system, display frames. Smooth soffit with an all-over pattern of random lights at approximately 12" to 18" centres. Gives clean appearance, and supplies light to surrounding areas. Lighting of soffit to be controlled by a minimum of three switches.
   a. for lights around perimeter,
   b. for lights of general field,
   c. for lights of central feature.

   Special circuit installed with outlets for flood and spot lighting. Special circuit installed near entrance of soffit and connected to emergency lighting system, to provide light at this point in case of breakdown in normal system.

FOYER

General 10 f.c. Special areas 25 f.c.

Bright spots located near ramps, steps, areas in front of ticket office and cloak rooms. Illuminated signs to indicate different rooms, and all exit doors and traffic systems.

MAIN LOBBY

10— General, 20— Special areas.

Lighting in lobby to be warm enough to be flattering, and bright enough to highlight jewels. Directed so that it will not spill into house. Illuminated signs indicating traffic system, cloaks, exit doors. Tinted tall mirrors preferred to standard silver mirrors. Use of suspended ceiling and columns for lighting positions.

SOCIAL ROOMS AND LOWER LOBBY

Plus raised portion comprising of lounging space and sitting area, lit with from 10 f.c. to 25 f.c. A pale magenta light to be achieved by using roundels or fluorescent tubes. General area of social rooms to be from 10 f.c. to 15 f.c. of pale magenta light, supplemented by a secondary system of 10 f.c. of white light to highlight an audience when used for public meetings. Area near refreshment stand, stairways, exits (and area assigned for a small orchestra when used as ballroom) to have 25 f.c. intensity. A special lighting effect could be the installation of a revolving colored illuminated sphere.

UPPER LOBBY

As lower lobby.

AUDITORIUM PROPER

15 f.c. of white light from concealed or low-brightness sources installed in ceiling. Light passing through small holes or louvered openings. Dimmers for house lights go from main panel to a sub-panel then to house light switches and dimmers. Electrical or mechanical mastering facilitates all selected house lighting circuits. In addition to main switch and circuits breakers, small individual switches to control orchestra pit lights, pinrail, and scene dock worklights, rehearsal lights, and convenience outlets. All switches to be silent. Sub-panels to be situated for easy access to responsible person, and audience must have no access to them.

Follow spots, situated at rear wall over balcony, or at side walls. Use maximum number of spots required.

Projection booth, situated at rear wall over balcony with provisions for television cameras.

Visibility lights (special), aisle lights to be provided near floor on each or on alternate aisle seats. Minimum safe number and arrangement of aisle lights is one for every three rows on alternate sides of the aisles, plus lights on both sides of aisles where there is a step or change in pitch of the floor, and at intersections and ends of aisles and crossovers. Luminous guide lines and tread edges in carpet, activated from ultra violet sources, is an adequate system.

All doors must have exit lights over them, and if fire regulations permit should be blue instead of the usual red.

For decorative effects it is advisable to have a system where the walls, ceiling and proscenium can be illuminated, both by white and colored lighting (for mood). This can be effected by installing the system in coves of wall and ceiling.

For certain performances (i.e. soloists etc.,) provision for lighting up cyclorama in soft colors shall be provided.

Spot lights to illuminate performers must be placed at 45° in plan and elevation from every position where the actor is to be seen within the sightlines of most of the audience. This requires ceiling slots at 45° to the downstage half of acting area, another near the stage for use when proscenium opening is high, and one further back in house when orchestra pit is used as playing area. Ceiling slots to extend whole width of auditorium.

STAGE LIGHTING

Plays, Operas, Operettas, Dramas etc.

a. **Visibility** - To make it possible for audience to see and for director to control attention by variations in intensity and color.

b. **Naturalism** - Lighting on stage must imitate natural or artificial lighting of supposed place where action of play occurs.

c. **Design** - Lighting is part of the scenery design. Designer is responsible for stage lighting, therefore it must be very flexible.

d. **Mood** - Lighting should create mood, and atmosphere for audience.

LIGHTING SCENERY

Provisions for a system of border lights to be hung immediately upstage at proscenium, and one or more rows further upstage as necessary. An adequate system of footlights to be installed at forestage.

LIGHTING OF CYCLORAMA

Provision for upward projection of light onto cyclorama with minimum masking.

Disappearing footlights in front of cyclorama.

MOTIVATING LIGHTS

i.e. (Sunlight through window—and other special stage effects).

Mounted in position where best effects obtained.

LIGHTS USED FOR EMPHASIS

To give one area more prominence than another. The curtain and drops for play scenes could be illuminated by lights mounted on balcony fascia.

Other locations for special equipment and effects are:

a. Extension of the optimum ceiling slot down the sides of the Auditorium.

b. Spotlight booths at the rear of balcony at either side of projection booth.

c. Ceiling and side proscenium slots for gauze and tormentor lighting, transformations, disappearances, fog and clouds.

d. Pockets in the stage floor located at either side and behind acting area.

FOLLOW SPOTS

For spectacles, presentations, operas, musicals. Positioned in rear wall over balcony, use as many as possible, maximum 18.

PROVISIONS

a. Access to all concealed lighting position from backstage and attic, for ceiling lights in auditorium, by direct unobstructed routes.

b. Mounting apparatus to be adjustable to allow the use of various types and sizes of instruments.

c. Electrical outlets equal to the maximum number of instruments which may be placed in any position. Connectors on all instruments standardized to fit all outlets. For presentation, opera, pageant or legitimate production. 300 k.v.a. per thousand of audience for all stage and house lights is a good rule.

OVERHEAD LIGHTING

Most important overhead mounting position is directly behind the teaser. Here are the positions for the spotlights for acting areas, striplights for blending and toning both acting area and settings.

PAINT SHOP LIGHTING

Evenly distributed white or daylight flourescent, or cold cathode lighting. Auxiliary circuit to supply evenly distributed incandescent light from stage type flood lights.

BOX OFFICE LIGHTING

Light concentrated on working areas 25 f.c. with additional general illumination.

Special lighting effects will be required in the following areas:

Basement Level
- Social Rooms
- Refreshments

Main Floor Level
- Vestibule
- Main Foyer
- Sunken Lobby
- Refreshment Counter
- Main Stairs
- Promenade and Exhibition Area
- Rehearsal Room

Upper Lobby Level
- Main Stairs
- Upper Lobby and Exhibition Area

LIST OF SPECIALIZED REQUIREMENTS

A) SOUND AND LIGHT CONTROL

Sound Control Booth located near the projection booth at the rear of the balcony.

Stage Lighting Control Console at front of the orchestra pit.

Number of border lights on stage 5 to 7 is adequate. All border lights shall be properly counterweighted. Borders in 4-colors: — red, white, blue, green or amber.

Footlights in front of stage and at the cyclorama—preferable of the disappearing type—should also be in four colors.

Dimming circuits 400 to 500 A., 110v., capacity for lighting loads.

Moveable horn for motion pictures, rolling off stage when not used or stored in the flies.

B) PROJECTION

Specifications for projection room planning to be obtained from Theatre Regulations, see also Time-Saver Standards, Graphic Standards, etc.

Vibration factor in projection rooms should be kept to a minimum.

Inadequate stiffness in construction, permitting as little as 1/500 in vibration in the projection room floor, could cause one half of an inch and over jitters of images on the screen.

Location of the projection booth in the rear wall of the balcony.

Protection room should have available 110 A, 110 V.

Provisions to be made for one small film camera 16 mm and two 35 mm equipments.

Allow space for rewinding.

A washroom or toilet compartment should be provided inside the projection booth unit.

C) LIGHTING MAINTENANCE

At least 6' clearance between roof structure and the suspended acoustical ceiling of the auditorium should be provided for cleaning and relamping of the ceiling fixtures in the auditorium proper.

The structure of the catwalks to be determined according to the roof structure.

D) AIR IRRADIATION

Provisions for air irradiation of the auditorium proper should be made by means of germicidal lights, which shine diagonally across ceiling. The lights should be concealed and not visible to the audience.

E) SPECIAL INSTALLATIONS

Electronic Tuning Fork— (note "A") gives the note on the platform and in the artists' rooms.

Piano Lift from air-conditioned instrument store, which also houses the console of the organ. In front of the lift a recessed box to contain a telescopic cinema screen.

Loud Speakers incorporated in reflectors above forestage to serve the organ and the public address system. Use such system as to avoid the "double voice".

Polished Reflectors near the platform level to assist the artists to hear the orchestra as a whole.

Loud speakers in the dressing rooms, lounges, social rooms, etc., for broadcasts of proceedings on the stage to all areas for the public and performers.

Kitchen to be equipped with electric service lifts for the service of refreshments at dances, banquets, etc., with electrically heated hot cupboards and cafe sets, refrigerators, meat slicers, glass and dish washers.

Centralized Vacuum Cleaning Plant with plug-in outlets throughout the building.

Automatic Fire Detectors with an indicator at a central point to show the location of any break. The alarm is given by a bell and by direct telephone to the fire brigade.

Fully Automatic Internal Telephone installation and a comprehensive bell and lamp indicator signal system to provide for inter-communication.

Master Impulse Clock system operating slave clocks throughout the building.

The Broadcasting Commentator's room and Recording room are served by conduits to suit cables of the broadcast companies. Facilities for suspension of microphones in the body of the hall to be provided.

F) LIGHTING

Players' scores should be nearly upright on the stands. If vertical lighting from above, reading difficult.

Disappearing footlights.

Traps containing microphone plug sockets for speech amplification.

Floodlights over the platform should provide sufficient intensity of lighting for performances and functions to be **televised**.

Revolving colored illuminated sphere for ballroom lighting effects.

Hall illumination tungsten filament lamps in decorative fittings.

Controls of platform and general lighting motorized dimmer banks operated by remote controls in few (3 or more) different positions.

APPENDIX "B"

Outline of Procedures

EMPLOYED IN THE COMBINED ARCHITECTURAL AND ACOUSTICAL DESIGN OF THE PROVINCIAL AUDITORIUMS IN EDMONTON AND CALGARY, ALBERTA

I. GENERAL DESIGN CONSIDERATIONS:

(a) Analysis of the chosen shape of auditoriums, advantages and comparisons with respect to the function, esthetics and acoustics.

(b) Shape, volume and other features required for the achievement of most desirable acoustical features.

(c) Stage and orchestra requirements.

II. INTEGRATION OF ACOUSTICAL PRINCIPLES INTO THE ARCHITECTURAL DESIGN:

(a) Graphical determination of sound-distribution patterns.

(b) Elimination of unbalanced zones.

(c) Mathematical evalution of established geometrical shapes.

(d) Practical tests and their analyses.

(e) Preliminary decay curves.

(f) Application of absorbing areas, sizes and values to balance intensities.

(g) Reverberation time.

(h) Adjustments.

(i) Percentage articulation, possible resonance, etc.

(j) P.A. System requirements with respect to function and acoustical data.

III. CONTROL OF SOUND TRANSMISSION:

(a) Air- and solid-borne noise. Structural shell design for air-borne noise, applying principles for sound reduction.

(b) Air conditioning system, mechanical and electrical equipment. Noise from stage equipment, acoustical influence of adjacent rooms.

IV. PLANNING DETAILS:

Esthetical evaluation of acoustical design.

I. GENERAL DESIGN CONSIDERATIONS

The planning of the Provincial Auditoriums in Edmonton and Calgary was governed by the basic consideration to provide in both cities remarkable provincial centres for cultural, educational, recreational, religious functions and other public endeavours.

The requested multiple use of the Auditoriums affected the arrangement of the plan and made it possible to provide a large auditorium proper with a spacious reception foyer in front of it, a group of social rooms with an exhibition area at the lower level, and a large stage with necessary back stage rooms behind the proscenium opening.

Buildings of this kind, however, must also provide a large amount of ancillary accommodation and this accommodation has been placed around and below the auditorium proper. This not only is economical from the point of view of convenient planning and well organized traffic routes, but has also the advantage of creating a surrounding shell to the house proper, reducing the danger of external noise to a controlled minimum. The auditorium proper, therefore became an inner acoustical core to the building, protected on all sides by its enclosing envelope of front and social rooms, ancillary rooms along the splay walls, and the soundproofed attic above.

After establishing the position of the auditorium proper in respect to the building structure itself, the primary consideration in the preliminary phase of the design was given to the development of convenient, safe and comfortable public areas, where the human instinct and the audience's desire to see and to be seen, be achieved to the best advantage.

The "open plan" of the front rooms with a visually clear separation of the foyer and the checkroom facilities from the slightly raised main lobby and promenade, with a lounge and refreshment areas, did satisfy the demands of the audience to feel itself part of the show from the moment it comes within sight of the auditorium until the grand curtain is lowered and the audience departs. Also this plan satisfies the requirements of good showmanship in regard to elimination of distraction, creation and maintenance of a desired atmosphere of the house, eliminating any possible fatigue of the audience.

The decorative scheme and selected focal points such as the curved lounge area overlooking the open space of the main social room at a level below contributes to the feeling of spaciousness, brightness and luxury.

The volume and shape of the auditorium proper was firstly established by the limitations of good sight lines, adequate visual acuity and the requested capacity. The acoustic studies were conducted coincidentally with the physical design, giving the designers an instrument to control the position of walls and the shape of floors.

The sight lines determined the proscenium splay and house width; the visibility limits governed the depth; and the desired capacity was checked against the economical aspects of the whole building. Following the rules of sight lines and applying the formulae of visual acuity, where normal human vision can perceive a minimum dimension or separation equal to one minute of visual arc (translated into space measurement this means that at 10 feet a normal eye can perceive a dimension of .035 inch, at 50 feet, .175 inch, and at 100 feet, .35 inch), the area of maximum seating value was established approximately elliptical with dimensions of the axis parallel to proscenium opening of 68 feet, and the axis perpendicular to the proscenium of 94 feet. Beyond this elliptical area additional seating was sought and provided at minimum sacrifice of sight lines in the extension of this area to a fan shape with "broken" splayed walls. As far as possible the lesser desirable seats in the extreme rear corners were eliminated by aisles and crossovers.

The rows of seats are curved or broken with orientation towards the stage. The center of curvature is located on the center line of the auditorium approximately the depth of the house behind the proscenium.

To assure best visibility from any seat a satisfactory stagger of seats was provided. This staggering was accomplished by the non-uniform placement of seats of varying widths in succeeding rows. Due to this arrangement a most desirable acoustical perception for the individual listener was achieved.

The total seating capacity of the auditorium was to be approximately 2,700 seats, with 1,280 seats in the Front Stalls, 770 seats in the Grand Circle, and 650 seats on the Balcony. In addition, space for wheel chairs and auxiliary seating was planned, bringing the total capacity of the house to 2,875. The volume of the house was computed as approximately 760,000 cubic feet. The per capita volume was therefore 264 cubic feet.

The reverberation time, as still the main, if not only, criterion which can be used with a certain accuracy, and which remains the most im-

portant single objective measurement that can be made, was chosen to conform with the recognized American figure (Knudsen) as 1.7 seconds. This figure more closely represents the conditions desirable for multi-purpose halls of that size, where a shorter R.T. provides suitable conditions for speech, and still gives an adequate R.T. for music, where generally a longer R.T. would be preferred.

In practice, one is unlikely to achieve too much absorption for speech or, conversely, too long a reverberation, without echoes, for music, particularly for choral work.

In obtaining the desired R.T. the volume was estimated, and the mean height of the ceiling established.

It was believed that the fan-shaped hall is most suitable not only from the point of view of maximum seating under best seeing conditions, but also considering the effect of path differences, the value of reflection, and the behaviour of absorbents.

In a fan-shaped hall the reflected sound waves reach the audience more quickly, and with sufficient absorption and diffusion in the rear wall, and provided the latter is not made concave on plan, there is no danger that the sound waves may return to the front of the house and cause echoes.

Especially for speech, a lower figure of path differences of direct sound and first reflections— not greater than 45 feet— was considered desirable, and once more, the fan-shaped plan did prove to be the answer, bringing the audience closer to the sound source.

Factual knowledge is lacking on the methods of application and the use of specific materials with desired acoustical properties.

The technique now in use for measuring reverberation times has not been very precise and the figures given for the coefficients of absorption have been both inaccurate and incomplete. Inaccurate because the variations due to different methods of applying the materials concerned have not been recognized; and incomplete because frequencies other than an average of 500 c.p.s. are rarely available. The actual conditions under which the absorbent materials are applied in a hall may vary considerably from the absorbent values derived from laboratory tests. Furthermore, widely different figures have been quoted for certain important absorbents by different authorities (e.g. various figures are given for absorption by an audience, by chairs, etc.) The difficulty in selecting materials for the auditorium was to obtain enough low frequency absorption. By using extensive wood panelling on strapping over the greater part of the side walls, it was calculated that these would absorb sufficient low frequencies by being set in motion by the sound wave and so taking energy from it. In order to avoid resonance at any particular frequency over a wide area, the individual panels are made to resonate at different frequencies by varying the depth of the space behind, and also varying the amount of bracing at the back. The efficiency of the panels can also be increased by incorporating rock wool or fibreglas in the space behind the panels. Adjustments are possible, and certainly will become necessary, by removing any number of the panels, taking out the fibrous backing, filling the space with solid material, adding reflectors, etc.

A hard surface above the sound source with a powerful first reflection directed towards the rear of the house was considered very important. The hard plastered ceiling panels are shaped and suspended from the sub-structure in such a way as to insure a good first reflection of sound. These will be described in detail in the following section. To assure a high quality of acoustics, and therefore contribute a great deal to the whole interior design, which encompasses acoustics, seating, decoration and lighting, a series of acoustical trials are inevitable during the application of finishing materials, and after completion. These tests will make it possible to measure and establish the actual acoustical characteristics of the auditorium; also, they will provide necessary data for any corrections and adjustments desired for any improvement of the acoustical quality in regard to different functions performed in this building.

The stage area, permitting a great variety of performances and activities as laid down in the overall design, was acoustically divided into several classes. The most prominent of these classes were orchestral work, soloists and drama. Consequently, the stage and areas directly around it received detailed studies on design not only from the theatrical viewpoint but also, and very definitely, from that of sound production. In drama work, any sound created on the stage may be considered to come from one or several sources. Due to the relatively high volume of the house, it was felt advisable to install amplification systems for speech, in particular due to the fact that in amateur performances untrained voices usually are used. The amplification systems are dealt with extensively in the next section.

For operatic performances, ballet, etc., an orchestra pit, sufficiently large to accommodate 70-75 musicians, is provided. For any symphonic work, the orchestra pit will be covered, thus creating a forestage for large orchestra and choir settings. A great many different layouts in this respect have been designed and built; very few, however, seem to

have incorporated all the desired features. For this reason, a number of conductors on this continent were consulted, and Leopold Stokowski's detailed recommendation adopted. The main features of this design are a semi-circular layout of orchestra, arranged in continuous steps. This allows the conductor to see every one of the musicians and vice-versa, brings the musicians closer around the conductor. This arrangement gives ample space for soloists, two grand pianos and results, of course, in an esthetically pleasant and compact layout. Sufficient space was provided for a choir, arranged in 6 rows behind the orchestra and being elevated in steps. A reflector shell around and above, with some lighting effects, encloses and unites the orchestra with the auditorium proper.

II. INTEGRATION OF ACOUSTICAL PRINCIPLES INTO THE ARCHITECTURAL DESIGN

(a) Graphical Analysis:

Parallel with the general design of the auditorium proper, a series of sound distribution patterns was graphically established. These patterns, following the actual physical behaviour of sound waves, will immediately determine a number of facts, showing clearly any deficiency and indicate proper corrections. In this particular case, the general design determined the seating layout splay and slope (to the vertical) of walls, the grand circle, and balcony. The shape of the ceiling was given fairly wide tolerances. Considering the variety of performances, reduced in the acoustical design to point sources of various positions and area sources (orchestras), the only shape of the vertical plane silhouette of the ceiling, yeilding good graphical results for any source and yet remaining within the limits of economy, was found to be function ($y = -\tan x$). The intersection of the "x" and "y" axis was placed at the extreme upper rear of the ceiling and a suitable value for "x" was chosen in order to terminate the ceiling at the proscenium arch. Thus, with minor corrections, the vertical silhouette of the ceiling was established.

Although a more or less parabolic curvature in the transverse section of the ceiling will result in better hearing conditions, two factors have led to a ceiling which is in the horizontal plane, essentially straight. The first factor was a result of combined acoustical and esthetical considerations. The plan being fan-shaped, and the seating arranged in consecutive curves (which curves are bisected by the splayed walls at approximately right angles), it was felt that the ceiling should preferably follow a similar pattern. This was accomplished by breaking the ceiling into a number of curved bands yielding reasonably good distribution patterns for area sources. The second factor was of purely economical nature. The cost of constructing a ceiling which is curved in the horizontal and vertical plane would be considerable.

(b) Elimination of Unbalanced Zones:

Having established the correct geometrical shape of the auditorium proper, zones of reduced loudness (shadow zones) were eliminated by continous adjustments of walls and ceiling shape to the point of reasonable uniformity regardless of position of listener and sound source.

Bearing in mind that the concave rear wall will invariably result in echoes, several systems of complete diffusion were investigated and the most suitable type chosen. Areas within the audience, which were exposed to excessive loudness due to several reflections, required balancing by diffusing. Thus, portions of walls and ceilings were designed to yield sufficient diffusion.

(c) Mathematical Evaluation:

At this point, a preliminary computation of the reverberation time was carried out, showing that relatively little absorption would be needed. The magnitude of 2 (Reverberation time equation) was taken as .05 (high reflectivity).

Subsequent to the foregoing process, a mathematical evaluation of the combined shape (applying analytical geometry) showed that, with the exception of minor deficiencies, the shape was correct. The exact physical dimensions, curvatures etc. were thus finalized.

(d) Practical Tests:

In order to verify the mathematical and geometrical analysis, several ripple tank tests were conducted. Due to laboratory limitations, water was chosen as a medium in which the waves were produced by using an intermittent air stream. The image of the wave patterns was projected onto a screen and photographed. A plane and longitudinal section were tested and the results verified.

(e) Preliminary Decay Curves:

From mathematical data obtained, as outlined in (c) loudness and decay patterns could be established. Nine positions within the audience were chosen and the loudness due to direct sound and 2-5 reflections computed. The original loudness and resulting total loudness at point of investigation were determined as a magnitude in watts/cm^2 and converted into decibels. Decay curves, plotting watts/cm^2 over time, revealed the likely character of reverberation. Decay curves were drawn for all selected points and subsequent corrections, especially by diffusing, were made. Since 2 as explained in (c), was taken as .05, no consideration as yet had been given to any particular frequency.

(f) Correction:

The decay curves showed that a smoothing-out process would be necessary. Using combined corrections, employing absorption and diffusion relative to positions within the auditorium, peaks in the decay curves were eliminated. It must be born in mind that no increase in loudness could be supplied, due to the low value of 2 and the now no longer flexible shape. This process included the application of absorbing material, which in the following process led to computations of reverberation time.

(g) Reveberation Time

The reverberation time, at 512 c.p.s. was, after consulting vast amounts of available data, chosen to be 1.7 seconds, the lower limit being 10-16 watts/cm2. Employing the R.T. (Knudsen) equation where

$$t_{60} = \frac{0.049\,V}{S\,[-2.30\,\log_{10}(1-2)]}$$

the R.T. was found to be above the value of 1.7 seconds. By increasing all areas uniformly in their absorbing power, the resulting R. T. was brought to the desired 1.7 seconds, the house being three-quarters occupied. In the process of increasing the absorption, great care and consideration was given to have the absorption coefficients alike or approaching closely the values of available materials The R.T. was thereafter computed for other frequencies than 512 c.p.s., employing ratio R (as given by V. O. Knudsen) in the equation $t_f = t_{512} R$. The deviations of the R.T. from this equation were within permissable limits. Esthetical considerations as to the most desirable materials led to the choice between various available surfacings having like properties.

(h) Adjustments:

The choice of absorbing materials was, however, subject to investigations of steady-state sound pressure at several frequencies for which absorption required several adjustments to follow closely the Fletcher-Munson loudness curves.

Plotting the R. T. for several frequencies, and comparing the decayed loudness at a given point of time-elapse, the derived values were compared with the F.-M. loudness curves. No major adjustment appeared desirable.

(i) Percentage Articulation:

Since the auditorium incorporated theatrical performances and meetings etc., the retention of clarity of speech is of great importance.

Using the foregoing data, a percentage articulation of 80% was calculated, for a central position (no amplification system included). Comparing this figure with available data and taking into account the volume of the auditorium, this figure was felt to be well within reason.

(j) Sound and Amplification System:

In addition to the acoustical design, an extensive amplification system is provided within the house proper. The basic purpose of this system is to increase the sound level, in particular in the rear portion of the house during theatrical performances. To facilitate this, two main speaker groups are provided, the first group consisting of four units, having a frequency range 30 c.p.s. to 15,000 c.p.s. These units will be located near the proscenium arch. The second group consists of 6 units with a similar frequency range, the units being located at the rear of the house. Both groups are matched with a crossover network, the second group being operated through a tape recorder delay system. All speakers will be adjusted as to their loudness level in accordance with the intensity drop to a given position. A series of permanent microphones will be installed within the proscenium arch and the ceiling of the house, being directly connected to the main console. Several microphone outlets at the stage area allow conversion into a P.A. system. The entire layout is arranged according to the principles of STEREOPHONIC Sound distribution. Other provisions are made for direct recording television broadcasting, cinematographic productions, backplay of tape and disc recordings, etc. Most of these facilities are controlled from the main sound console. Other speaker groups and microphones are located at strategic points throughout the auditorium. All speaker groups and microphones will respond to a range of 30 c.p.s. to 15,000 c.p.s. and are controlled from the main console. Independent circuits are installed for television and broadcasting.

III. SOLID AND AIR BORNE NOISE

(a) External:

In selecting the locations for the auditoriums, great emphasis was given to all possible occurrence of external noise. On both sites, in Edmonton and Calgary, the possible sources of noise from adjacent areas and roads were few and the distances to roadways sufficiently great. In both auditoriums however, provisions had to be made to reduce noise of low flying aircraft. The penetration of sound from such sources would occur through the roof and ceiling as well as through the walls, and any openings in the walls and stage tower. As a suitable countermeasure, a double-shell system was designed resulting in a theoretical reduction of 80-90 db. Since externally solid-borne noise through the ground appears unlikely, no special provisions were made.

(b) INTERNAL:

Solid-borne noise from within the building, the direct source being motors and fan vibration, was counteracted by isolating of rotary equipment as much as possible. The two systems of boxing-in and suspension with shock-absorbing isolators were used. Airborne noise from ducts, anemostats, motorized dampers, was reduced by the use of proper baffling and insulation. In order to absorb and nullify any noise from the machine room, which is located below the front stalls, a number of provisions have been made. Firstly, a secondary ceiling supported from the floor, independent of the main structure, was placed between the machine room and house. All columns supporting the floor slab of the house are encased from machine room floor to secondary ceiling. The underside of this slab will be sprayed with acoustic plaster. Adjacent areas to this room are divided by corridors and cavity walls in order to reduce lateral penetration of noise.

(c) ADJACENT AREAS:

A careful examination of adjacent rooms and areas led to minor acoustical adjustments for these areas. In the original design of the auditoriums, care had been exercised to have no reverberant corridors directly adjoining the auditorium proper.

IV. PLANNING DETAILS

The esthetical evaluation of the acoustical design with reference to finishes found its way into the methods of application of absorbent, reflecting and diffusing materials on the ceiling, the floors, the side walls, the back wall, the balustrades of the grand circle and the balcony, and in the way of treatment of these finishing materials.

Since there have been many changes in the building industry engaged in the production of acoustical materials, consideration was given to alternative materials not listed in the standard publications concerned with acoustics.

To facilitate the design and to check the products finally to be used, a number of tests were conducted in the Sound Chamber of the National Research Council in Ottawa.

These tests included complete reverberation chamber measurements and sample tests for quality control purposes.

An acoustically correct hall in itself represents sufficient magnitude and beauty, and does not require any fancy treatment. Therefore, the walls, ceiling, and floors are treated exclusively in a way to contribute as much as possible to the atmosphere wanted in a multi-purpose gathering place of this nature. They are plain and without obstructions, no small scale decorative features are used. The natural beauty and richness of the french walnut panelling of the side walls will pleasantly contrast with the pure white ceiling panels and the darker shades of carpeting in the aisles. The lively colors of the seating upholstery, and the warm tones of the back walls, cross-over railings, and balustrades, will be subordinate elements in the overall balance of the esthetic harmony.

An important function was given to the house illumination, involving requirements of good visibility, decoration and mood. No open light source is used where it can distract from the showman's desire to produce a good show and establish an actor-audience relationship of a total uniform stimulus and reaction, without which a performance never can reach its peak of effectiveness.

CONDENSED LIST OF DEPARTMENT OF PUBLIC WORKS STAFF CONNECTED WITH THE DESIGN AND SUPERVISION OF THE PROVINCIAL JUBILEE AUDITORIUMS EDMONTON AND CALGARY

ADMINISTRATION AND GENERAL OFFICE

Hon. James Hartley, *Minister of Public Works*

Stanley E. Kenworthy, *Assistant Deputy Minister*

Arthur Arnold, *Deputy Minister*

V. C. Heim, *Co-ordinator of Works and Maintenance*

ARCHITECTURAL BRANCH

Ronald Clarke, *Chief Architect*

D. Panar, *Consulting Mechanical Engineer*

Harold T. Howard, *Administrative Assistant*

R. G. Proudfoot, *Supervising Electrical and Mechanical Engineer*

J. F. Hunt, *Chief Engineer*

Bev Brooker, *Supervising Structural Engineer*

ARCHITECTS AND ARCHITECTURAL DRAUGHTSMEN

Arnold B. Steinbrecher, *Project Architect*

G. A. Jellinek, *Senior Architect*

Miss C. Blakney
W. Wood
W. Nieman
L. Torok
N. Flak
L. A. Cysouw
C. H. Kamp
A. H. Preston
D. Hooke
W. Tiffin
K. Gericke

ACOUSTICAL GROUP

Wendell E. Rossman

Martin F. Fayers

ARCHITECTURAL SPECIFICATIONS

Paul H. Tuckwell

STRUCTURAL ENGINEERS AND DRAUGHTSMEN

D. Moore, *Project Engineer*

J. Smart
D. Harris
J. Mekechuk
E. G. A. Henderson

ELECTRICAL AND MECHANICAL ENGINEERS AND DRAUGHTSMEN

H. Neelands
W. Strange
H. W. Krussman
B. Vanderboor
H. Lucas

KITCHEN EQUIPMENT

W. W. Lowrie

SURVEYORS

T. Kostiuk
L. Malmberg
A. Barclay

During various phases of the design and preparation of working drawings, a number of other architects, engineers and draughtsmen were engaged on the auditorium job. In the majority of cases these men have left the office of the Department of Public Works or have been working on the auditorium only a very short time.

INSPECTORS

A. Edinga, *Supervisor of Construction*
G. Brubaker, *Job Inspector, Calgary*
H. O. Kinsey, *Job Inspector, Edmonton*
R. Wilson, *Plan Checker, Edmonton*

D.P.W. SHOPS AND SUPERVISORS

A. R. Henkelman, *Maintenance Supervisor, Edmonton*
S. Ramsey, *Electrical Supervisor*
J. A. Inglis, *Maintenance Supervisor, Calgary*
J. Longmore, *Supervisor of Painting and Decorating*
C. Paul, *Supervisor, Calgary*

EXPEDITER

E. E. Wilson

SECRETARIAT, MATERIAL SUPPLY, PRINTING

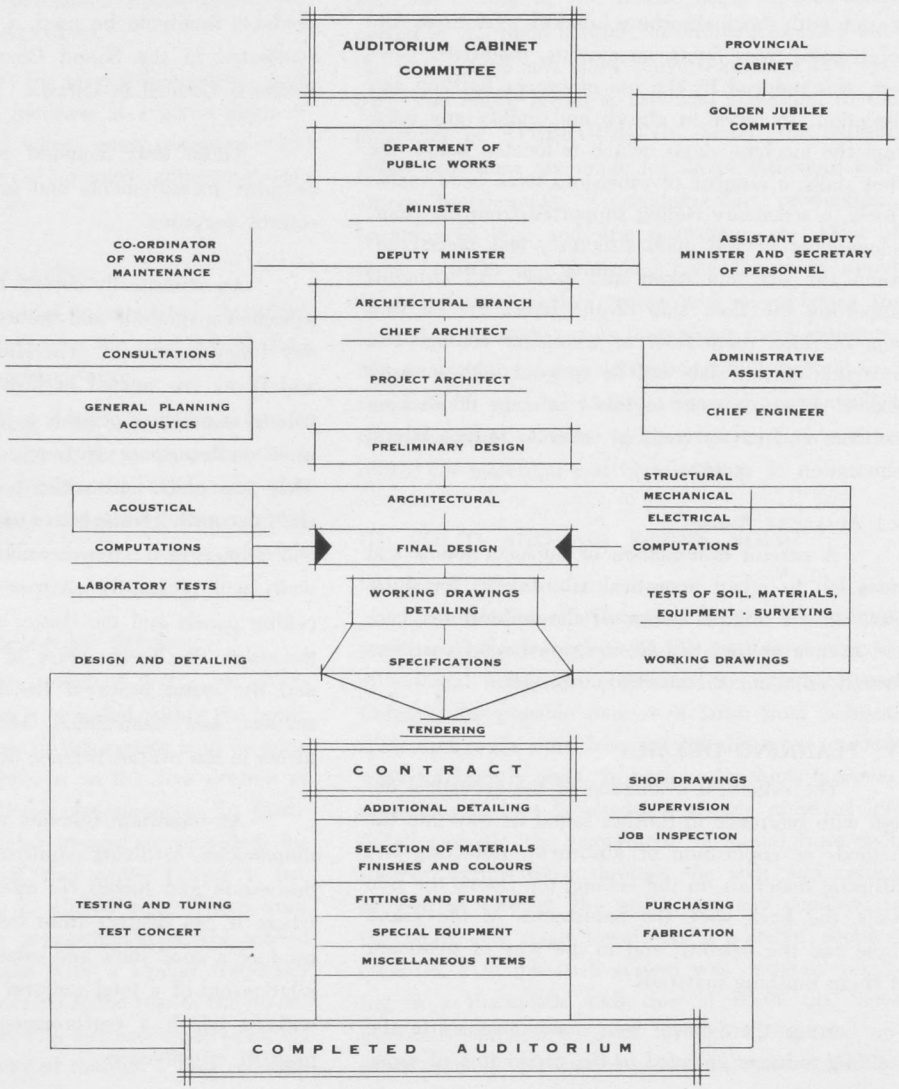
Mrs. E. Kenny
Miss D. Cashman
Miss J. Mansfield
Miss M. McNeill
Miss J. Ewaschuk
Miss B. Mercer
Mrs. E. M. McInerney
Miss E. M. Crowther
H. Wigston
G. Hanke
C. Lannard
R. Hughes
H. Behrens

Note:

A complete list of Department of Public Works' personnel connected with the planning and construction of the Jubilee Auditoriums is included on pages 98 and 100.

APPENDIX "D"

DESIGN, ADMINISTRATION AND SUPERVISION OF THE WORK IN CONNECTION WITH THE ALBERTA JUBILEE AUDITORIUMS



List of Contracts

1. SITE PREPARATION, EXCAVATION AND SERVICES
   Advertised: October 12, 1954; Awarded: October 20, 1954 to:
   W. C. WELLS CONSTRUCTION COMPANY

2. SUPPLY AND INSTALLATION OF SOUND, INTERCOMMUNICATION AND TELEVISION SYSTEMS
   Advertised: October 30, 1954; Awarded: November 10, 1954 to:
   CANADIAN ELECTRONICS

3. LAYING OF STEAM AND CONDENSATE LINES
   Advertised: November 13, 1954; Awarded: November 23, 1954 to:
   BURNS AND DUTTON

4. FOOTINGS AND FOUNDATIONS
   Advertised: November 29, 1954; Awarded: December 28, 1954 to:
   BURNS AND DUTTON

5. SUPPLY AND ERECTION OF STRUCTURAL STEEL
   Advertised: December 9, 1954; Awarded: December 22, 1954 to:
   DOMINION BRIDGE

6. SUPPLY AND INSTALLATION OF ONE ELECTRIC FREIGHT ELEVATOR AND TWO ELECTRIC DUMBWAITERS
   Advertised: January 10, 1955; Awarded: February 3, 1955 to:
   TURNBULL ELEVATOR COMPANY

7. INSTALLATION OF STORM AND SANITARY SEWERS AND WATER DISTRIBUTION SYSTEM
   Advertised: January 19, 1955; Awarded: February 17, 1955 to:
   POOL CONSTRUCTION

8. GENERAL CONTRACT
   Advertised: May 16, 1955; Awarded: July 22, 1955 to:
   BURNS AND DUTTON

9. ELECTRICAL CONTRACT
   Advertised: May 16, 1955; Awarded: July 22, 1955 to:
   HUME AND RUMBLE

10. MECHANICAL CONTRACT
    Advertised: May 16, 1955; Awarded: July 22, 1955 to:
    LOCKERBIE AND HOLE CANADIAN COMSTOCK

11. KITCHEN EQUIPMENT
    Advertised: Purchasing Agency; Awarded: June 18, 1956 to:
    SOMMERVILLE COMPANY

12. ASBESTOS CURTAIN AND RIGGING, COUNTERWEIGHT SYSTEM, STAGE DRAPERIES, ETC.
    Advertised: Purchasing Agency; Awarded: June 27, 1956 to:
    R. L. GROSH AND SONS, HOLLYWOOD, CALIFORNIA

13. PROJECTION EQUIPMENT
    Advertised: Purchasing Agency; Awarded: July 23, 1956 to:
    SHARP'S THEATRE SUPPLIES

14. PAVING OF PARKING LOT
    Advertised: Select Bid; Awarded: November 6, 1956 to:
    BURNS AND DUTTON

15. CHINA, GLASSWARE AND BEVERAGE MAKING EQUIPMENT
    Advertised: Purchasing Agency; Awarded: November 29, 1956 to:
    SOMMERVILLE COMPANY

16. CHAIRS
    Advertised: Purchasing Agency; Awarded: December 18, 1956 to:
    RAILWAY AND POWER ENGINEERS
    DOMINION SOUND EQUIPMENTS LTD.

17. CARPETS
    Advertised: Purchasing Agency; Awarded: December 28, 1956 to:
    T. EATON COMPANY

18. DRAPERIES
    Advertised: Purchasing Agency; Awarded: February 28, 1957 to:
    HUDSON'S BAY COMPANY

19. FURNITURE AND MISCELLANEOUS EQUIPMENT
    Advertised: Purchasing Agency

Correlation of Principal Rooms and Areas to Proposed Functions

The Provincial Auditoriums are being planned and built for multiple uses and they will provide accommodation for various cultural, educational, recreational, religious functions and for other public endeavours.

Following charts show the correlation of rooms and areas, the capacity and the anticipated use. (Floor areas are taken with the inclusion of all ancillary rooms).

TABLE 1 — APPROXIMATE FLOOR AREAS AND CAPACITY OF ROOMS

No.	Rooms and Areas	Floor Area Square Foot	Capacity	Remarks
A.	FRONT ROOMS			
1.	Foyer with Cloaks and Restrooms	12,200	4,000	Cloakroom for 1,500 Coats
2.	Main Lobby, Lounge and Refreshment Areas	13,550	1,700	
3.	Upper Lobby	9,350	1,150	
4.	Balcony Promenade	7,150	900	
B.	HOUSE			
5.	Auditorium Proper			
	a. Front Stalls	12,200	1,268	plus 14-16 wheel chairs
	b. Grand Circle	6,050	825	
	c. Upper Balcony	5,800	657	
6.	Orchestra Pit	2,000	70-75	
7.	Light Control Console	50	1 chief electrician	all-electronic stage lighting control
8.	Projection Suite and Sound Control Room	1,200	2 operators 1 sound engineer	
C.	SOCIAL ROOMS			
9.	Lower Lobby	7,150	900	
10.	Main Social Room	3,350	400-500	
11.	Stage Platform	500		
12.	Banquet Room	1,350	170	
13.	Service Kitchen	1,500	2,000 cold servings	
14.	Assembly Room	1,300	200	
15.	Dressing Rooms	600	15-20 artists	
16.	Club Room	1,200	120	
17.	Exhibition Area	6,150	600	
D.	STAGE AND BACKSTAGE			
18.	Stage	6,000	50 sets	
19.	Dressing Suite	9,500	60 artists 60 musicians	
20.	Workshops and Storage Areas	14,000		
21.	Rehearsal Rooms	4,900	100-120 artists 80-100 spectators	
22.	Mechanical Rooms	20,000	150,000 c.f.m. conditioned air 250 tons refrigeration 900 K.W. power	

TABLE NO. 2 — ANTICIPATED USES OF AREAS

NO.	AREA	USES
1.	FRONT ROOMS	
	(a) Total Capacity 4,000	To be used complete or in parts for all functions.
2.	AUDITORIUM PROPER	
	(a) Total Capacity 2,750	(a) Pageants, Grand Operas and Ballet Presentation, Vaudeville-Revue, Operetta, Musical Comedy, Legitimate Drama, Concerts, Cabaret, Motion Pictures.
	(b) Total Capacity 2,875	(b) Social and civic meetings, assemblages of all sorts, Provincial, National, and International conferences and meetings.
	(c) Capacity 1,300 (front stalls only)	(c) Operatic and dramatic performances of local nature.
3.	SOCIAL ROOMS	
	(a) Capacity 400 - 500	(a) Local dramatic and musical performances, fashion shows, solo performances, chamber music, lectures, social meetings, dances, various receptions; overflow from 2a, 2b.
	(b) Capacity 170	(b) Banquets with regular meal servings.
	(c) Capacity 600 - 700	(c) Receptions with buffet-type servings.
	(d) Capacity 200	(d) Lectures, association meetings, particularly in the medical and scientific fields, business assemblages of local and provincal nature.
	(e) Capacity 3 x 200	(e) 4-H club meetings and activities.
	(f) Capacity 120	(f) Children's games and plays, women's auxiliary activities.
	(g) Capacity 600	(g) Exhibitions and displays of paintings, handicrafts, ceramics, school art, Indian and Eskimo art, 4-H displays, commercial art and publishers' displays, fashion shows, radio, T.V. and electronics displays, automotive shows etc.
4.	STAGE AND BACKSTAGE	
	(a) Stage	Staging everything from a grand opera, drama, ballet, pageant to symphony concerts, solo-performances, speeches, etc.
	(b) Rehearsal Rooms	Rehearsing of a cast up to 120 on the rehearsal stage or of soloists in separate rooms. Small performances for a limited audience of 80-100 listeners (club members, invited guests, etc.)
	(c) Workshops	Design and preparation of sceneries and properties for the Auditorium itself or for other urban or rural recreation halls and school auditoriums.

APPENDIX "G"

PROGRAMME OF

Testing of Materials

FOR THEIR ACOUSTICAL BEHAVIOR

The tests which are to be conducted in Ottawa, National Research Council, are the investigation of the absorbent capacity of:

WALNUT PANELS

FLOOR TILES

CARPETS

A. WALNUT PANELS

For the walnut panels, 6 to 9 test sets will be required, depending on the results of the 6th test.

In the first test the panels shall be without a crossmember, attached to a 2" by 4" strapping as proposed in the final installation. In the next test, a 2" fibreglas batten shall be pinned (special connection) to the back of the panels, filling the voids in the panel framing. The third test shall be conducted with one crossmember (glued in place) and in the fourth test 2" fibreglas shall be added in similar fashion as test No. 2. In test No. 5, two more crossmembers shall be added and in No. 6 fibreglas batten installed. All six tests shall be conducted for the following frequencies: 128, 256, 512, 1024, 2048, 4096 cycles per second. The density of fibreglas shall be approximately 4 lbs. with 1 pin connection per one square foot.

Should, upon analysis, in test No. 5 or No. 6 an absorption coefficient of 0.12 at 512 c.p.s. not be reached, and the variation over the total range of all conditions be not greater than 0.08 sabins, the density of the fibreglas shall be increased to 7 lbs. and 9 lbs. for test No. 7 and No. 8 whereas in test No. 9 one more crossmember shall be added with 8 lbs. density of fibreglas.

The total number of available coefficients will then be 9 at 512 c.p.s. with a difference of approximately 0.08 sabins.

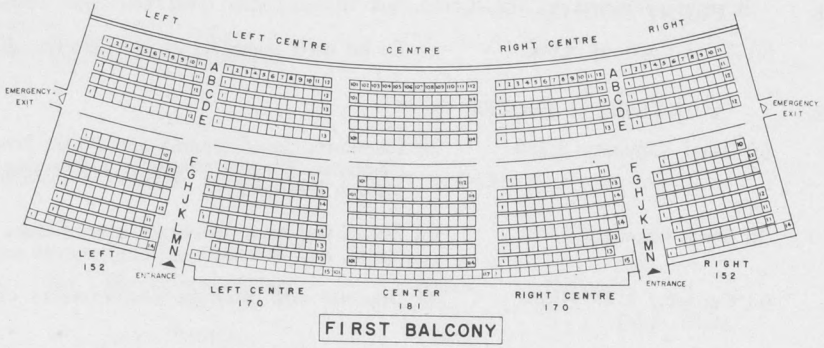
Should the herein described test not suffice, further alterations of conditions shall then "ad hoc" be devised within the material analysis of the design.

B. FLOOR TILES

For the flooring under the seats, the material "Hypalon" features the most promising acoustical and technical properties. 64 square feet of this material requires testing under similar condition as the final installation. The flooring shall be rigidly attached to either floor or wall or any other panel of reasonable mass. Test for the aforementioned frequencies will cover the requirements.

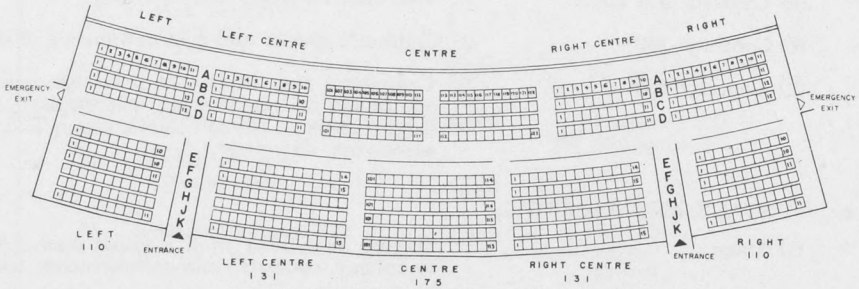
C. CARPETS

In order to arrive at some variation for carpets, at least three types should be tested. These three types include Worsted Wilton, Brussels weave, and perhaps one carpet to "Famous Players" specifications. Of each carpet, 64 square feet with underfelt must be available. Again the frequencies, previously indicated, are applicable.



FIRST BALCONY

SEATING LAYOUT OF AUDITORIUM PROPER

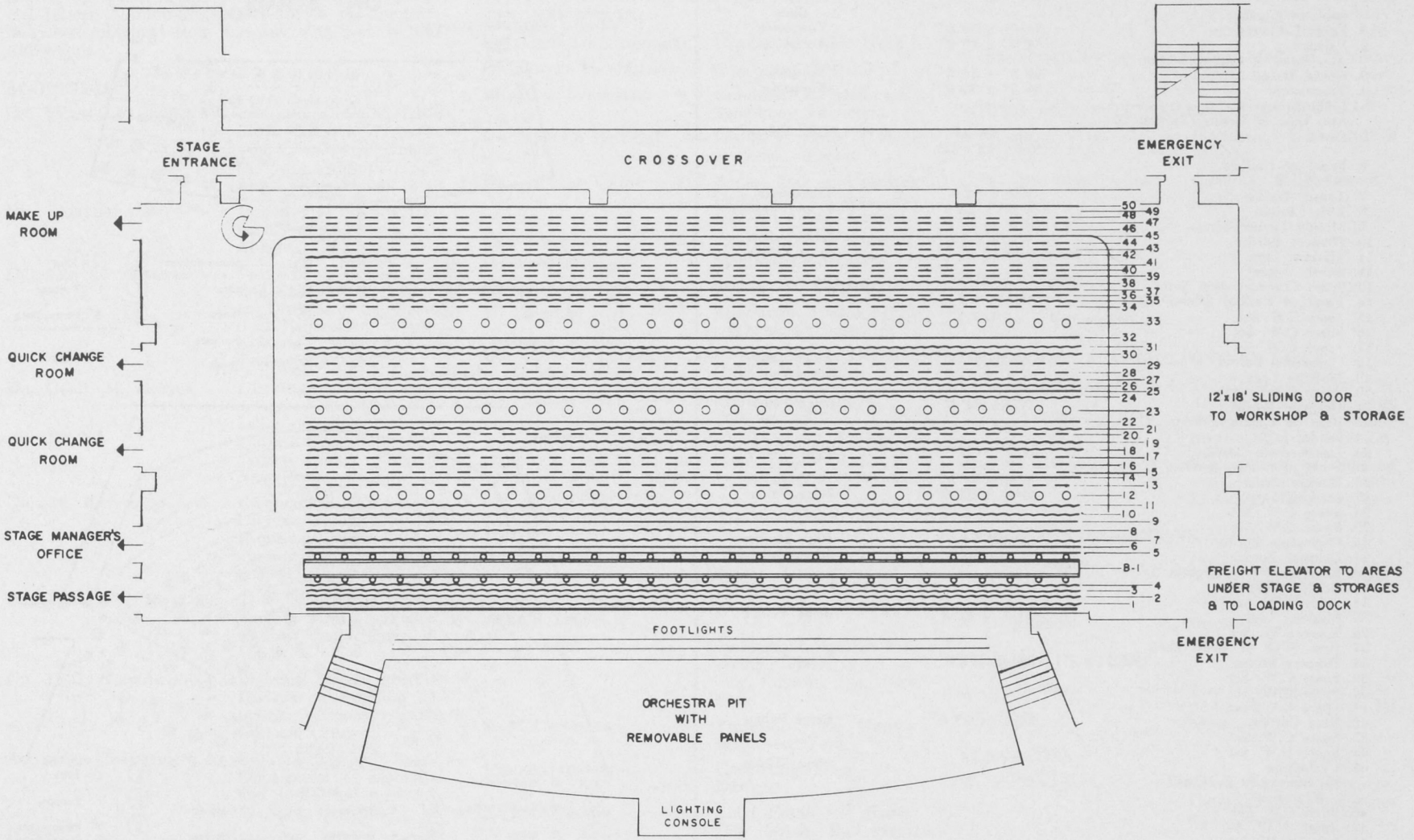


SECOND BALCONY

MAIN FLOOR

SCHEMATIC STAGE LAYOUT

APPENDIX "H2"



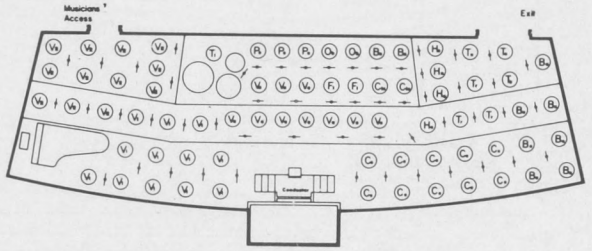
SEQUENCE OF RIGGING AND DRAPERIES

NO.	ITEM	SIZE	COLOR
	Asbestos Curtain		Blue
1.	Front Curtain	84' 0" x 39' 0"	Turquoise
2.	Valance	84' 0" x 10' 0"	Turquoise
	Also Front of Ceiling Section 'A'		
3.	Grand Drape	90' 0" x 16' 0"	Turquoise
4.	Tormentors	15' 0" x 39' 0"	Turquoise
B-1	Light Bridge		
	Also Rear of Ceiling Section 'A'		
5.	Portal	Top 68' x 8', Sides 12' x 24'	Black Velour
6.	Front of Ceiling Section 'B'		
7.	Teaser Border	Width 84' 0"	Turquoise
8.	Title Curtain	84' 0" x 33' 0"	Blue and Salmon
9.	Motion Picture Screen	64' 0" x 27' 6"	
10.	Drapery Border	Width 84' 0"	Beige Velour
11.	Masking Legs	20' 0" x 33' 0"	Beige Velour
12.	Border Light		
13.	Spare Counterweight Set		
14.	Front of Ceiling Section 'C'		
15.	Spare C.W. Set		
16.	Spare C.W. Set		
17.	Spare C.W. Set		
18.	Cyclorama Border	Width 84' 0"	Blue Muslin
19.	Masking Legs	20' 0" x 33' 0"	Beige Velour
20.	Spare C.W. Set		
21.	Drapery Border	Width 84' 0"	Beige Velour
22.	Rear of Ceiling Section 'C'		
23.	Border Light		
24.	Intermediate Curtain	84' 0" x 33' 0"	Beige Velour
25.	Front of Ceiling Section 'D'		
26.	Hanson Gauze	Width 84' 0"	White
27.	Masking Legs	20' 0" x 33' 0"	Beige Velour
28.	Spare C.W. Set		
29.	Spare C.W. Set		
30.	Cyclorama Border	Width 84' 0"	Blue Muslin
31.	Drapery Border	Width 84' 0"	Beige Velour
32.	Rear of Ceiling Section 'D'		
33.	Border Light		
34.	Spare C.W. Set		
35.	Masking Legs	20' 0" x 33' 0"	Beige Velour
36.	Spare C.W. Set		
37.	Rear Wall of Band Shell		
38.	Drapery Border	Width 84' 0"	Beige Velour
39.	Spare C.W. Set		
40.	Spare C.W. Set		
41.	Spare C.W. Set		
42.	Rear Curtain	84' 0" x 33' 0"	Beige Velour
43.	Spare C.W. Set		
44.	Spare C.W. Set		
45.	Cyclorama		Blue Muslin
	Fly-Storage of Bandshell Enclosure		
46.	Spare C.W. Set		
47.	Spare C.W. Set		
48.	Spare C.W. Set		
49.	Fly-Storage of All Ceiling Sections		
50.	Paint Frame	80' 0" x 36' 0"	

APPENDIX "H3"

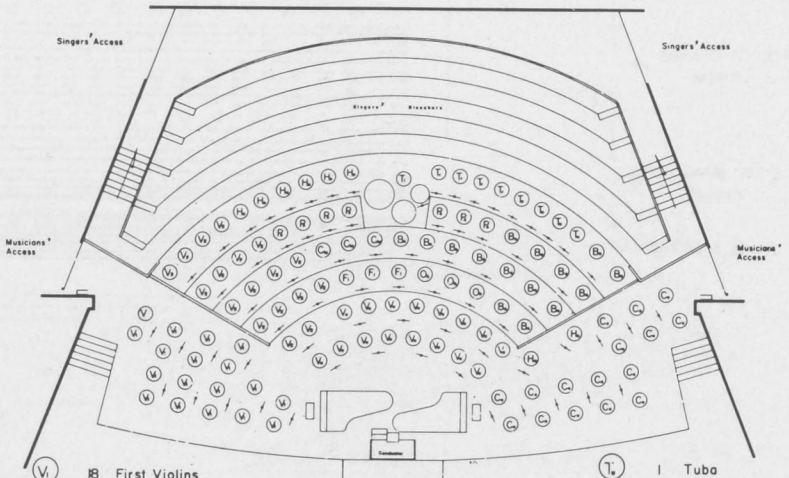
SCHEMATIC ORCHESTRA ARRANGEMENT IN PIT AND ORCHESTRA AND CHOIR ARRANGEMENT ON STAGE

ORCHESTRA ARRANGEMENT IN ORCHESTRA PIT



V_1	12 First Violins	B_b	2 Bassoons	B_b	7 Double Basses	T_b	1 Tuba
V_2	12 Second Violins	T_r	3 Trumpets	H_p	1 Harp	T_i	1 Timpani
V_a	10 Violas	H_n	3 Horns	F_l	2 Flutes	R	3 Percussions
C_b	10 Violoncellos	T_b	2 Trombones	C_{la}	2 Clarinets		
				O_b	2 Oboes		73 Players

ORCHESTRA AND CHOIR ARRANGEMENT ON STAGE



V_1	18 First Violins					T_b	1 Tuba
V_2	18 Second Violins	B_b	3 Bassoons	H_p	2 Harps	T_i	1 Timpani
V_a	16 Violas	T_r	4 Trumpets	F_l	3 Flutes	R	7 Percussions
C_b	16 Violoncellos	H_n	6 Horns	C_{la}	3 Clarinets		116 Players
B_b	12 Double Basses	T_b	3 Trombones	O_b	3 Oboes		220 Singers

Consultations and Experts

During the planning and construction of the Provincial Jubilee Auditoriums, expert advice and information were obtained from the following persons and institutions.

ACOUSTICS

Dr. Vern O. Knudsen - - Professor of Physics, Dean of the Graduate Division, Vice-Chancellor, University of California, Los Angeles, California.

Dr. Leo Delsasso - - - Professor of Physics, University of California, Los Angeles, California.

Dr. Leo L. Beranek - - Professor of Communication Engineering, Technical Director of the Acoustical Laboratory, Massachusetts Institute of Technology, U.S.A.

Dr. Cyril M. Harris - - Director, Acoustics Laboratory, Associate Professor of Electrical Engineering, Columbia University in the City of New York.

Dr. M. Rettinger - - - Engineering Products Division, Hollywood Film Recording, Radio Corporation of America, Los Angeles.

Dr. Arnold M. Small - - Chief, Reliability, Human Factors and Acoustics, Canvair, San Diego, U.S.A.

Dr. T. D. Northwood - - Building Physics Section, Division of Building Research, National Research Council, Ottawa.

Acoustics Committee - - -Building Research Board, Department of Scientific and Industrial Research, Watford, England.

E. M. P. A. - - - - - - - -Material Testing Laboratories at the Federal Institute of Technology, Zurich, Switzerland.

MUSIC AND GENERAL AUDITORIUM REQUIREMENTS

Dr. Leopold Stokowski - Conductor, New York.

Sir Ernest MacMillan - - Conductor, Toronto.

William Steinberg - - - Conductor, Pittsburgh Symphony Orchestra.

Dr. Arnold Walter - - - Professor, Royal College of Music, Toronto.

Dr. H. Le Caine - - - Radio and Engineering Division, National Research Council, Ottawa.

Lee Hepner - - - - - - Conductor, Edmonton Symphony Orchestra.

Clayton Hare - - - - - Conductor, Calgary.

H. Plukker - - - - - - - Conductor, Calgary Philharmonic Orchestra.

Dr. G. Waddington - - - Director, Music Division, C.B.C., Toronto.

Dr. Leslie Bell - - - - - Leslie Bell Singers, Toronto.

In addition to personal consultations and the use of papers on acoustical properties, published by the acoustical experts, mentioned under "Acoustics," advice was sought from:

CHAIRS AND CARPETS

Dr. R. N. Lane - - - - -Chief, Acoustics Laboratories, University of Texas, Austin, U.S.A.

STAGE DESIGN

E. F. Kook - - - - - - Professor, Columbia University, President, Century, Lighting Inc., New York.

S. McCandless - - - - - - Professor, Yale University, New York.

Joseph Meilziner- - - - - Consulting Stage Designer.

Eugene Braun - - - - - Chief Engineer, Radio City Music Hall, New York City.

Arthur Judson - - - - - Columbia Artists Management.

A. K. Gee - - - - - - - - President and Managing Director of Celebrity Concerts (Canada) Ltd.

S. Sonnenfeld - - - - - - Sales Manager, Century Lighting Inc. New York.

SOUND AND INTERCOMMUNICATION

A. R. King - - - - - - - Instructor, University of Alberta.

D. M. Beaupre - - - - - - Canadian Electronics Limited.

BROADCASTS

Radio Station CKUA

Radio Station CJCA

Sunwapta Broadcasting Co. Ltd.

CFRN - TV Channel 3

CITY CODES AND BUILDING BY-LAWS

City of Edmonton - - - -Departments of the City Architect, Town Planning, Building Permits, Engineering, Traffic Division.

City of Calgary - - - - -Departments of Building and Inspections, City Planning, Engineering.

THEATRE REGULATIONS

H. W. Burkell - - - - - Chief Inspector of Theatres, Department of Provincial Secretary.

K. D. Kremer - - - - - - - Inspector.

FIRE REGULATIONS

A. E. Bridges - - - - - - Fire Commissioner, Department of Provincial Secretary.

ELEVATORS

W. E. Sutton - - - - - - Chief Factory Inspector, Department of Industries and Labour.

ELECTRICAL INSTALLATIONS

I. G. Finlay - - - - - - - Chief Electrical Inspector.

CONDENSED LIST OF MAIN PROVISIONS, MATERIALS, EQUIPMENT AND FITTINGS

A. GENERAL DATA

(1) Edmonton site ..... 13 acres
Parking for approximately 800 cars

(2) Calgary site ..... 26 acres
Parking for over ..... 1,000 cars

(3) Overall building area ..... 1.5 acres

(4) Total cube, approximately .. 4,055,000 cu. ft.

(5) Seating capacity ..... 2,750 chairs

(6) Capacity of all social rooms, up to ..... 1,000 people

(7) Area of all lobbies, in excess of ..... 57,500 sq. ft.

(8) Area of Main Social room with platform ..... 3,850 sq. ft.

(9) Total area of exhibition space, about ..... 35,000 sq. ft.

(10) Capacity of orchestra pit .... 70 - 75 musicians

(11) Capacity of bandshell on stage ..... 100 musicians and 200 singers

(12) Stage dimensions — 120 feet wide by 48 feet deep with 17 feet deep removable forestage.

(13) Proscenium opening, finished — 75 feet wide by 35 feet high with provisions to reduce opening by a portal.

(14) Motion picture screen — 62 feet wide by 26.5 feet high.

(15) Number of rigging lines 50

(16) Flexible asbestos curtain with emergency release.

(17) Light bridge with connecting platforms to fly gallery and auditorium attic.

(18) Entrance doors for the public 23

(19) Entrances for staff and performers 2

(20) Emergency exits (in addition to No. 18 and No. 19) 11

(21) Loading doors 2

B. EXTERIOR FINISHES

(1) Precast terrazzo base ..... 810 sq. ft.

(2) Precast architectural face panels ..... 31,750 sq. ft.

(3) Brick veneer ..... 27,330 sq. ft.

(4) Precast architectural stone .. 6,000 sq. ft.

(5) Precast architectural concrete ..... 16,000 sq. ft.

(6) Exterior marble, from Vermont, U.S.A. ..... 1,150 sq. ft.

(7) Travertine, from Italy ..... 930 sq. ft.

(8) Slate stone, from New York State ..... 5,000 sq. ft.

(9) Mettowee stone flooring and pavement ..... 6,750 sq. ft.

(10) Glazing ..... 6,450 sq. ft.

C. INTERIOR FINISHES

(1) Terrazzo floors ..... 30,450 sq. ft.

(2) Ceramic tile and quarry tile floors ..... 5,650 sq. ft.

(3) Ceramic tile and glassy mosaic walls ..... 8,760 sq. ft.

(4) Rubber and vinyl tile floors ..... 22,950 sq. ft.

(5) Wood floors ..... 20,780 sq. ft.

(6) Carpets ..... 32,890 sq. ft.

(7) Concrete floors ..... 28,300 sq. ft.

(8) Hardwood panelling—
a. French walnut ..... 13,000 sq. ft.
b. American black walnut 11,400 sq. ft.
c. Mahogany ..... 1,010 sq. ft.

(9) Interior marble and serpentine, from Italy ..... 4,250 sq. ft.

(10) Mirrors and mirror walls .... 2,700 sq. ft.

D. OTHER PROVISIONS

(1) Number of stairs—
a. Main public stairs 2
b. Intercommunication stairs 11
c. Service stairs and steel ladders 7

(2) Electric freight elevator 1
a. Capacity—6000 pounds
b. Size of platform—7' 8" x 13' 11"
c. Levels to be served—4

(3) Electric dumbwaiters 2
a. Capacity—250 pounds
b. Size of car—3' 0" x 2' 6" x 3' 6"

(4) Ticket office
a. Wickets 4
b. Advance sales counter 1

(5) Cloaks —
a. Counter ..... 115 lineal feet
b. Coat racks for ..... 1,500 coats

(6) Rest Rooms:
a. For public: Men's 3
Ladies' 3
b. For staff and performers (private): 7
Men's 11
Ladies' 7

(7) Floral decorations — planting boxes 4

(8) Broadcasting booths 7

(9) Soundproof rooms for
a. Practice 4
b. Recording and transmitting 2

(10) Workshop and storage areas .... 14,000 sq. ft.

Stage Rigging and Equipment

(1) Gridiron of 3" steel channels at 6" o.c. on bearing steel beams, 85 feet over the entire stage area, total quantity of steel approximately 53 tons.

(2) Fly gallery 23' 9" above stage floor and loading platform suspended under gridiron 76' 0" above stage.

(3) Steel plated box-type beam for head blocks.

(4) Helical stair from stage to gridiron, with accesses to fly gallery and loading platform, 85' high.

(5) Counterweight system for 50 lines inclusive of act curtain, draperies, border lights, cyclorama, stage paint frame, etc., and consisting of:— Head and loft blocks, idler sheaves, take-up blocks, counterweight arbors, T-bar tracks on track hanger brackets, track leaders, hoisting steel cables and manila ropes, rope locks, hand lines, trim chains, turnbuckles, cable clamps, locking rail, index strip light, pipe battens, slot tracks, curtain motors ½ h.p., 3 phase, 60 cycles, 208V., strain insulators for borderlights, 250 pounds of counterweight for asbestos curtain and an average of 1,000 pounds of counterweight for each other line.

(6) Flexible asbestos curtain, straight fly, motor driven by a 3 h.p., 3 phase motor, with electrical controls and emergency release, painted, matching in color the auditorium ceiling with a design of the official crest and the Rosa acicularis—the floral emblem of the Province of Alberta—79' 2" x 38' 0".

(7) Flying lightbridge 80' long with connecting platforms to the fly gallery and to the auditorium attic, winch driven, equipped with borderlights and spotlights in four primary colors: red, blue, green and amber.

(8) Three borderlights in four primary colors.

(9) Main act curtain hand-operated, to fly.

(10) Portal with two side pieces, 12' wide by 24' high, and a top section 68' long by 8' high.

(11) Frame for motion picture screen, 64' 0" wide by 27' 6" high.

(12) Various draperies, borders, valance, masking legs, sky cyclorama, Hanson gauze drop etc., in turquoise, beige, blue, salmon and transparent colors, all flame-proofed; sets 24

(13) Spare sets 17

(14) Stage paint frame, about 80' 0" x 36' 0", with scaffold for painting.

(15) Removable traps in midstage, 2' x 9', total ..... 24 panels

(16) Floor cloth 45 feet by 90 feet.

(17) Footlights 60' long in three colours: red, blue and green.

(18) Removable panels to form forestage ..... 1,200 sq. ft.

(19) Additional paint frame in stage carpenter's workshop with counterweights, to slide in paint well below workshop floor level .... 28' x 20'.

(20) Quantity of main materials for stage rigging:
- a. Steel and iron, approximately ..... 20 tons
- b. Steel cables ..... over 12 miles
- c. Manila rope ..... 10,000 lin. ft.
- d. Counterweights ..... 51,500 pounds
- e. Asbestos cloth, wire inserted, weight 3¼ pounds per yard— about 340 sq. yds.
- f. Fabrics for draperies
  - Turquoise boucle yarn woven with imported Lurex thread ..... 1,560 sq yds.
  - Damask ..... 555 sq. yds.
  - Velour ..... 2,280 sq. yds.
  - Canvas ..... 1,240 sq. yds.
  - Gauze ..... 300 sq. yds.
  - Lining ..... 2,340 sq. yds.

(21) Bandshell for complete arrangements of a 100-piece orchestra and 200-voice choir on stage, consisting of:
- a. Elevated risers for orchestra ..... 56 units
- b. Elevated risers on collapsible bleachers for choir ..... 98 units plus 16 steps and risers.
- c. Surrounding wall panels, to fly, with provisions for adjustments in size and location 3
- d. Adjustable ceiling, sections 4
- e. Conductor's podium 1

Projection Equipment

1. Projectors, 35MM, heavy duty type, with electric change-overs, quick-change lens mounts, picture change-over solenoids and foot switches, 18" film magazines, projection lamps, 75 to 150 amps, projection throwup to 130' long, definition lenses, water cooling apertures; heavy duty pedestals with provisions for horizontal and vertical optical alignment plus angular adjustment facilities and leveling screws—2 units.

2. Optical sound 35MM reproducers of the rotary scanning type with a constant speed sound sprocket and a separate hold-back sprocket; exciter lamps of the pre-focused type—2 Units.

3. Complete amplifier system.

4. Two-way range, high-fidelity type speaker system with a cross-over frequency of 400 cps. Vertical and horizontal high frequency radiation to seating area with cellular type horns.

5. Motor generator of silent action, 25 H.P., for 3 phase voltages, to provide 125 to 250 amps DC for projector and arc lamp operations; starter with remote control station in projection room; integral built-in exciter generator.

6. Exciter lamp supplies—One D.C. supply for regular use, capable of continuous supply to two exciter lamps, and one A.C. supply for emergency, with switching panel from D.C. to A.C. supply.

7. Monitor speaker, 8 inch, to monitor motion picture sound in projection room.

8. Other film equipment and furniture such as rewind table, film splicer, automatic rewinder, hand rewinder, reel end alarm, film cabinets, magazines.

9. Port hole shutters and complete installation of counterweight system with fusible links, air cylinders, electric magnetic trips, controls, pulleys and cables, for silent operation of shutters.

10. Motion picture screen, 62 feet wide by 26.5 feet high, on steel frame, to fly, with speaker horn complete.

Sound, Intercommunication and Television Systems

A. SOUND FACILITIES IN AUDITORIUM PROPER:

(a) The main auditorium system is a two channel stereophonic type with a phantom third channel. This speaker group consists of four 18" very low frequency speakers, two mid-frequency horns and four high-frequency tweeters, installed in large speaker baffles in the sidewalls near the proscenium at 30 feet above the stage level.

(b) An additional group of six speakers, consisting each of one low-frequency woofer and one high-frequency tweeter, is located in the soffit under the balcony. These speakers are fed through an electric delay mechanism to increase definition in this area.

B. SOUND FACILITIES IN OTHER ROOMS FOR PAGING AND BACKGROUND MUSIC:

(a) In addition to the two main groups of the auditorium proper, a total of 29 two-speaker units are installed in all principal rooms throughout the building. Also, 25 speakers are provided in all public washrooms, in the dressing rooms, offices, announcers' rooms, workshops.

Further, 2 three-speaker units are installed in the Main Social Room and 1 three-speaker unit will be in the Conductor's Room together with a high fidelity record player.

C. SOUND CONTROL CONSOLE:

The sound control console is located on the Grand Circle level in a sound-insulated room behind the rear wall of the auditorium proper. The console consists of:

(a) One patch panel for 12 input channels, each with a maximum of 85 db gain to line level, and each controlled with its own vertical attenuator, inputs to and outputs from tape recording equipment, lines to television dock, also for interconnection of all major components.

(b) Bank of switch keys to take care of all normal operations such as switching, monitoring, loudspeaker selection to one of the six output channels, switching from binaural to monaural sound, etc. Switching provides for preconnecting up to 24 microphones to the 12 input channels and selecting them at will.

(c) Two 16" turntable consoles with two pick-up arms, one of which is a studio type magnetic reproducer, and the other is of a type specifically designed to play binaural records.

(d) A professional tape recorder for two channel stereophonic use is also included. This will allow the recording of rehearsals, their playback, as well as to provide continuous background music or incidental sounds to certain types of productions.

(e) Six 200 watt amplifiers will drive all auditorium and ancillary loudspeakers through a master speaker switching panel.

(f) Equalizers and pads are incorporated to feed two telephone lines for remote broadcasting at any level up to 14 dbm.

(g) An electronically operated excited tuning fork at concert pitch 'A' is provided as the seventh channel for switching to any of the speaker groups.

D. MICROPHONES:

Sixty-one microphone outlets are strategically placed in all principal areas, both public and operational. All of these outlets are terminated on a jack field located in the sound control room, thus enabling the selection of any individual outlet or group of outlets in any desired combination.

The auditorium proper alone has ten microphone lines suspended from the ceiling, three lines at the light bridge, five outlets in the footlights, four outlets in the orchestra pit, and six outlets for off-stage pick-up.

All microphone inputs are standard at 150 ohms and line outputs standard at 600 ohms.

E. INTERCOMMUNICATION SYSTEM:

A master station with sub-masters and 19 remote circuits to 32 stations with selective calling and selective talking devices are installed in all important areas of the backstage rooms.

Loudspeakers, telephone handsets, and call lights are an integral part of these remote stations.

F. TELEVISION SYSTEM:

a. Eleven camera positions are located throughout the building: eight positions with view of the main stage, two positions on the rehearsal stage, and one camera position in the Green Room.

b. Each of the camera positions is wired by an individual standard camera cable to the T.V. dock. This T.V. dock is sufficiently large to receive a large mobile T.V. unit.

c. Two 27" T.V. sets are provided in the Main Social Room for pick-up of performances on the main auditorium stage.

d. To further increase the flexibility of any broadcasting operations, a utility cable is incorporated providing 27 pairs of line feed and talkback facilities looped through all 11 broadcasting booths and T.V. camera positions, and terminated in each booth and camera position on a standard terminal board.

Any of these pairs may be picked up in the Sound Control Room and patched over to outside lines.

BROADCASTING:

Broadcasting, telecasting or recording is possible from the Main Stage, the Rehearsal Room, and for single camera telecasting from the Green Room. Also, broadcasting and recording, monaurally or binaurally, can be done from the Main Social Room, the Banquet Room, the Assembly Room, the Exhibition Area, and Main Lobby, and the Upper Lobby.

Food and Beverage Handling Facilities

A. SERVICE KITCHEN — located on Social Room level. 1120 sq. ft. including separate washroom accommodation. Primarily designed for caterers, cooking and preparing on their own premises; a limited amount of preparation and cooking can accommodate small banquets, estimate up to 200 persons could be handled. There is a complete mechanical refrigeration system operating a 660 cu. ft. meat and main cooling room, also a 380 cu. ft. general service room (Milner Walk-in boxes). A refrigerated sandwich and salad unit with chilled-water service, a 40 cu. ft. reach-in-refrigerator and a 56 lb. capacity ice-maker.

A heavy duty gas range battery with two oversize ovens provides roasting-broiling-grill-boiling and hot top service. A 7' 6" long gas-fired steam table with six 12" by 20" openings provides volume serving capacity. Dishwashing, complete with all auxiliaries, will handle loads of 500-1000 persons per meal period. There is a heavy duty continuous feed mechanical garbage disposer, three-compartment pot-wash sink and a 20-lb. capacity vegetable peeler available.

Urn battery is gas fired, 3 piece, 10-20-10 gals., with urn stand. Pyrex liners, automatic control and thermostats.

For heavy short-period demand there is a 100 gals. gas fired (industrial type) coffee urn with thermos jug service.

Ice cream cabinet is 15 gals. capacity, food slicer is adjustable; there is a portable sink, chef's table, chopping block, lowerators, etc.

The kitchen services directly into the Banquet Room (seating 100 persons), along with the Social Room and the Assembly Room, which are all interconnected; a banquet of 550 persons can be seated at one time.

B. CONCESSION COUNTERS — located to right and left of main floor Lounge area and serviced by dumbwaiters from service kitchen; main use is during intermission periods.

There are 24 three-gal. Stanley thermos jugs for heavy short period demand of coffee service. Each counter fitted with a Vaculator automatic coffee maker capable of producing one-half-gallon coffee on a three-minute cycle; to maintain service during change of thermos jugs and provide continuous service during quiet periods when service kitchen is closed down, sandwiches or light refreshment could be handled from both points to any area involving the Lounge or Main Floor. There is a sink for washing small items, also lock-up storage for tobaccos, etc.

C. GREEN ROOM — back-stage on the stage level, serves mainly the artists. Fitted to handle light refreshment for artists while on the premises. Domestic-type refrigerator, counter-type electric hot plate and a wash-up sink incorporated into a cabinet counter. This is not normally public access space, is easily serviced from kitchen, would have to be waitress service if more than coffee and sandwich required.

D. MUSICIANS' LØUNGE — backstage on the Social Room level, is equipped similarly to the Green Room. For use of musicians while off-stage during rest periods. There is a domestic-type refrigerator, hot plate and sink. Accessible from the service kitchen if waitress service is required.

For a large production there could be upwards of 150 persons using the Green Room and Musicians' Lounge during practice rehearsals and actual show time.

E. GLASSWARE AND CHINA — 100 dozen 8-oz. Libby glasses are provided. China is plain white English vitrified hotel ware. 1200 settings provided to meet the heaviest anticipated demand and maintain reserve stock to take care of loss and breakage, settings complete for full banquet service.

Main china storage is in the passageway off the Banquet Room; immediate-use-storage is in the dishwashing area, portable lowerators, rack dollies with sanistack racks and lowerators in the steam table provide easy movement of china for instant use.

F. BEVERAGE-MAKING EQUIPMENT

100-gal. urn— 1,500 cups coffee or tea, 1½ - 2 hours from dead cold to ready time, transfer to thermos jugs and refill urn if required.

10-20-10 urn battery— 600 cups coffee or 300 cups tea, 1 hour from dead cold to ready time. Banquet service and auxiliary to main urn.

10 gals. per hour automatic coffee makers—instantaneous on a 3-minute cycle (push-button operation.) with every piece of equipment in use it is possible to produce 2400 cups of coffee with a 2-hour warning period.

With a full house in the auditorium, a convention in the social room, a meal in the banquet room, a meeting in the assembly room, it is possible to have 3400 people in the building at one time.

Service has been arranged to take care of any type of situation that is liable to arise.

Organs and Pianos

Each auditorium is equipped with the following musical instruments:

1. One two -manual Allen electronic organ, complete with tone chambers.
2. One concert model Hammond RT-3 organ, complete with 2 HR-40 tone cabinets.
3. One Steinway model D concert grand piano.
4. One Heintzman model G grand piano.
5. One Steinway professional upright piano.
6. One Heintzman conservatory upright piano.
7. Necessary benches and stools in matching styles.

CONDENSED LIST OF FURNITURE AND MISCELLANEOUS EQUIPMENT

1.	Auditorium chairs	2750
2.	Lounge chairs	82
3.	Adjustable chairs	4
4.	Reclining chairs	1
5.	Armchairs	22
6.	Various chairs	70
7.	Chairs with table	3
8.	Folding chairs	347
9.	Stacking chairs	572
10.	Stools	38
11.	Dressing stools	80
12.	Lounges	37
13.	Various desks	9
14.	Various tables	208

15. Draughting table	1
16. Filing cabinets	7
17. Banker's safe	1
18. Benches	11
19. IBM Lectern	1
20. Showcases	8
21. Display easles	12
22. Music stands with lamps	101
23. Ticket dispensing machines	2
24. Coinometers	2
25. Ticket stub boxes	8
26. Usher's spot mats	16
27. Standee posts and ropes, sets	11
28. Usher's flash lights	20
29. Desk lamps	26
30. Table lamps	23
31. Draughting lamps	2
32. Costumers and garment holders	5
33. Clothes hangers	2197
34. Wall type coat hooks	15
35. Linen towel holders	54
36. Paper towel dispensers	7
37. Sanitary napkin receptacles	37
38. Utility receptacles	14
39. Waste receptacles	28
40. Waste baskets	75
41. Waste cans	3
42. Garbage cans	17
43. Sand urns	76
44. Ashtrays	370
45. First aid cabinets	11
46. Electric refrigerators	2
47. Electric hot plates	2
48. Sewing machines	3
49. Steam Irons	3
50. Ironing boards	3
51. Wrapping paper cutter	1
52. Ladders	4
53. Storage dollies	6
54. Stacking and folding chair carts	
55. Janitors' equipment and supplies	

APPENDIX "R"

DRAPERIES OTHER THAN STAGE DRAPERIES

(1) Main Lounge draw-curtain about 86 feet long by 14.5 feet high, double faced, 50% fullness, hand operated, in gold metallic boucle ..... 468 sq. yds.

(2) Social Room stage curtain, about 35 feet wide by 16.5 feet high, 50% fullness, hand operated, complete with rigging system, in gold metallic with lining ..... 102 sq. yds.

(3) Draw window draperies on "Lilo" tracks in cloakroom, homemaker pattern fabric, lined, five pairs ..... 20 sq. yds.

(4) Draw window draperies on "Lilo" tracks in public toilets, resin-tex fibreglas fabric, in green and charcoal, lined, five pairs ..... 20 sq. yds.

(5) Fixed wall draperies on "Lilo" tracks in concession areas, resin-tex fibreglas fabric in tobacco ..... 60 sq. yds.

(6) Draw window drapery, full length of wood valance on window wall on "Lilo" track in Green Room, "Jofa" Greige fabric, lined, treated for flame resistance ..... 48 sq. yds.

(7) Draw curtains, 10 single widths, to each of 3 wardrobe units, light grey fibreglas fabric ..... 193 sq. yds.

(8) Draw window draperies on "Lilo" tracks in practice rooms and backstage stairway, in George N. Jackson Ltd. fabric, "Rangoon Toast," lined, four ..... 112 sq. yds.

In addition, in the auditorium in Calgary are installed: a total of 18 pairs of draw window draperies on "Lilo" tracks to hang from ceiling to floor in Upper Lobby and Balcony Promenade, 150% fullness resin-tex fibreglas fabric. in ECRU plain ..... 1,560 sq. yds.

Total quantity of Draperies:—

(a) For the auditorium in Edmonton ..... 1,023 sq. yds.

(b) For the auditorium in Calgary ..... 2,583 sq. yds.

APPENDIX "S"

PREPARATION OF DRAWINGS AND SPECIFICATIONS

A. Preliminary Design	No. of Sheets	Specification Pages
1. Outline of requirements		98
2. Preliminary sketches, No. 1 to No. 7		
3. Final preliminary design	5	
4. Presentation drawings	11	
5. Preliminary Acoustical design	3	
B. General Contract Drawings		
1. Architectural drawings	139	
2. Structural drawings	81	
3. Mechanical drawings	87	
4. Electrical drawings	56	
5. Site services, pavement and landscaping	21	
6. Specifications		312
C. Additional Details Issued During Construction		
1. Architectural		
(a) drawings	143	
(b) sketches	65	
2. Structural	29	
3. Mechanical	28	
4. Electrical	11	
5. Site services, paving and landscaping	7	
D. Drawings and Specifications for Separate Contracts		
1. Site preparation, excavation and services, Edmonton	8	49

	No. of Sheets	Specification Pages
2. Laying of steam and condensate lines, Calgary		
3. Footings and foundations	3	39
4. Supply and erection of structural steel	13	29
5. Supply and installation of sound, intercommunication and television systems		38
6. Supply and installation of freight elevator and dumbwaiters	1	11
7. Installation of storm and sanitary sewers and water distribution system, Calgary	6	28
8. Kitchen equipment and refrigeration system	2	29
9. Asbestos curtain and rigging, counterweight system, stage draperies, etc.	7	55
10. Projection equipment	1	33
11. Paving of parking lots and landscaping	30	55
12. Carpets	3	31
13. Chairs	4	35
14. China, glassware and beverage making equipment		10
15. Draperies		5
16. Furniture and equipment		38
17. Cabinetwork by D.P.W.	15	
TOTALS:	760	797

Architectural Design

A. During the planning of the auditoriums the layout and design of many similar projects and existing buildings were studied and reference publications used.

(1) The Royal Festival Hall in London, England.
(2) The Kleinhans Music Hall in Buffalo, U.S.A.
(3) The Radio City Music Hall in New York City.
(4) The Henry and Edsel Ford Memorial Auditorium in Detriot, U.S.A.
(5) The Kresge Auditorium at the Massachusetts Institute of Technology in Cambridge, U.S.A.
(6) The Municipal Theatre and Concert Hall at Malmo, Sweden.
(7) The Gothenburg Concert Hall in Gothenburg, Sweden.
(8) The "Aalborg Hallen" in Aalborg, Denmark.
(9) The "Kongresshaus" and "Tonhalle" in Zurich, Switzerland.
(10) The Music Hall in Grenchen, Switzerland.
(11) The Liverpool New Philharmonic Hall in Liverpool, England.
(12) The Colston Hall in Bristol, England.
(13) The Free Trade Hall at Manchester, England.
(14) The Cleveland Auditorium, Cleveland, U.S.A.
(15) The Playhouse in Cleveland.
(16) The Purdue University Music Hall, Lafayette, Indiana, U. S. A.
(17) The Oberlin College Theatre, Oberlin, Ohio, U.S.A.
(18) The University of Indiana Hall of Music, Bloomington, Indiana, U.S.A.
(19) The Lawrence College Theatre, Appleton, Wis.
(20) The New States Opera in Munster, Germany.
(21) LeTheatre de Beaulieu à Lausanne, Switzerland.
(22) The Auditorium and Coliseum at Charlotte, North Carolina, U.S.A.
(23) The Speech Arts Building at Orange Coast College in Costa Mesa, California.
(24) The Convention and Exhibition Hall in Corpus Christi, Texas.
(25) The Convention Hall in Matsuyama, Ehime, Japan.
(26) The (proposed) National Theatre in Mannheim, Germany.
(27) The Exhibition Hall in Karlsruhe, Germany.
(28) The League of Nations Palace at Geneva, Switzerland.
(29) The Palace of Soviets in Moscow, U.S.S.R.
(30) The United Nations Buildings in New York and in Paris.

B. The creative work of following leading architects was studied for information on auditoriums and theatres.

(1) Walter Gropius
(2) Frank Lloyd Wright
(3) Richard J. Neutra
(4) Eero Saarinen
(5) Marcel Breuer
(6) Oscar Niemeyer
(7) Le Corbusier
(8) Alvar Aalto
(9) Pietro Belluschi
(10) Ludwig Mies van der Rohe
(11) Wallace Kirkman Harrison
(12) Minoru Yamasaki
(13) Chusev, Vlasov and Sheltowski

C. a. GENERAL PLANNING;

"Theatres and Auditoriums"—The comprehensive work by Harold Burris-Meyer and Edward C. Cole was extensively consulted. Following professional magazines and periodics were searched for additional information:

(1) Progressive Architecture, U.S.A.
(2) Architectural Record, U.S.A.
(3) Architectural Forum, U.S.A.
(4) Journal, Canada.
(5) The Architect and Building News, England.
(6) Architectural Design, England.
(7) Werk, Switzerland.
(8) Schweizerische Bauzeitung, Switzerland.
(9) Schweizerische Technische Zeitschrift, Switzerland.

(10) Technische Rundschau, Switzerland.
(11) Bauwelt, Germany.
(12) Baumeister, Germany.
(13) Theatre Catalog, U.S.A. - Editions 1947 to 1955.

b. STAGE DESIGN

(In addition to the book "Theatres and Auditoriums", by H. Burris-Meyer & Edward C. Cole.)

(1) "Producing the Play", by John Gassner.
(2) "New Scene Technician's Handbook," by Philip Barber.
(3) "Municipal Auditoriums," by F. G. Symons.
(4) "A Method of Lighting the Stage," by Stanley McCandless.

Acoustical Design

The acoustical design and computations were based on theories and findings of a number of outstanding acousticians and experts, such as:

(1) Dr. Vern O. Knudsen
(2) Wallace C. Sabine
(3) C. F. Eyring
(4) H. Fletcher & J. C. Steinberg
(5) L. L. Beranek

The following acoustical papers and publications formed the reference material for the acoustical design:

(1) Acoustical Designing in Architecture; Knudsen & Harris; J. Wiley, New York, 1955.
(2) Applied Architectural Acoustics; Michael Rettinger; Brooklyn, Chem. Pub. Co., 1947.
(3) Acoustics Measurements; Leo. L. Beranek; J. Wiley, New York, 1956.
(4) Acoustical Properties of Carpet; Cyril M. Harris, J. acoust. Soc. Am. Vol. 27, No. 6. (1955).
(5) Absorption Characteristics of Upholstered Theatre Chairs and Carpet as Measured in Two Auditoriums; R. N. Lane, J. acoust. Soc. Am. Vol. 28, No. 1. (1956).
(6) The Acoustics of the Royal Festival Hall, London; Parkin & Allen, "Acoustica", 1953, 3 (1), pp. 1-21.
(7) Review of Architectural Acoustics during the past 25 years V. O. Knudsen; J. acoust. Soc. Am. Vol. 26, No. 5, 646-650, Sept. 1954.
(8) Planning for Good Acoustics, Hope-Bagenal & Wood.
(9) Watson, Acoustics of Buildings.
(10) Sound Absorption of Wood panels in the Royal Festival Hall, Parkin & Purkis, Acoustica, Vol. 2, 1951.
(11) Concert Hall Acoustics, Hope Bagenal, Part I and II RIBA Journal, Dec. 1948 and Jan. 1949.
(12) Sound Insulation and Acoustics, H. Creighton.
(13) The Contemporary American Organ; William H. Barnes; J. Fischer, New York, 1937.
(14) Handbuch der Orgelkunde; W. Ellerhorst; Benziger, Switzerland.

APPENDIX "U"

Table of Comparisons:

DESCRIPTION OF AUDITORIUM PROPER AND YEAR OF COMPLETION	APPROXIMATE DIMENSIONS LENGTH	WIDTH	HEIGHT FLOOR TO CEILING	TOTAL AUDIENCE
1. **Alberta Jubilee Auditoriums, 1957.** Fan-shaped. Ramped main floor. Two raked balconies. Twelve different shaped ceiling panels.	152' to fire curtain	80' at front 162' at rear wall	50' average	2,750 plus 14 wheel chairs
2. **Royal Festival Hall, London, 1951.** Partly fan-shaped seating area within rectangular plan. Fully raked. Stepped orchestra platform. Reflecting area in front. Suspended canopy.	170'	100' between walls 80' at front	65'-40'	2,800 plus 250 choir plus 300 standing
3. **Kleinhans Music Hall, Buffalo, 1944.** Elliptically shaped. Sloped floor. Flat stage. One gallery.	170'	125' average	50'-45'	3,000
4. **Salle Pleyel, Paris, 1928.** Megaphone-shaped. Slightly raked floor. Two galleries.	164'	68'	80'	3,000
5. **Royal Opera House, Covent Garden, London, 1858.** Horse-shoe plan. Slightly ramped floor. Coved ceiling. Five tiers of boxes and galleries.	95' to fire curtain	90'	56'	2,052

Table of Comparisons, Continued

DESCRIPTION OF AUDITORIUM PROPER AND YEAR OF COMPLETION	APPROXIMATE DIMENSIONS LENGTH	WIDTH	HEIGHT FLOOR TO CEILING	TOTAL AUDIENCE
6. **Kresge Auditorium at Massachusettes Institute of Technology, Cambridge, 1955.** Elliptically-shaped. Ramped floor with raked rear seating. Dome with many suspended "clouds".	90'	Approx. 50' at podium 130' at rear wall	42' at centre of dome	1,238
7. **Municipal Theatre and Concert Hall at Malmo, Sweden.** Fan-shaped. Raked floor and balcony. Ceiling broken in panels.	No dimensions available			1,600
8. **Gothenburg Concert Hall, Gothenburg, Sweden.** Megaphone-shaped. Slightly ramped floor. Broken side walls and ceiling.	138'	85' average		1,246
9. **Oberlin College Hall Auditorium in Oberlin, U.S.A.** Ramped floor. Irregular shaped walls and ceiling.				600 (approx.)
10. **Auditorium and Coliseum, Charlotte, North Carolina, 1956.** Fan - shaped. Ramped floor and raked balcony. Ceiling broken in 6 panels with sound canopy at proscenium.	110' to fire curtain	60' at front 118' at rear	48' average	2,500 auditorium seating
11. **Henry and Edsel Ford Memorial Auditorium, Detroit, 1956.** Fan - shaped. Ramped floor. One raked balcony. Proscenium. Conventional stage.				2,900 (approx.)
12. **The "Aalborg hallen". Aalborg, Denmark, 1953.** Rectangular. Flat floor with provisions for ramping of rear seats on bandcars. Revolving stage 52.5'. Reflecting canopy above concert platform. Slightly curved ceiling crosswise with sloped panels lengthwise. Sidewalls slightly inclined, and broken at the concert platform.	223'	105'	46'	1,796 theatre seating 3,334 seats for conventions etc.

APPENDIX "V"

LIST OF EXPERTS AND PRINCIPAL PARTICIPANTS IN THE TEST CONCERT HELD IN THE NORTHERN ALBERTA JUBILEE AUDITORIUM AT EDMONTON ON APRIL 8TH, 1957.

EXPERTS:

1. Dr. Vern O. Knudsen - - - - - - -	Vice-Chancellor, Dean of Graduate Division, Professor of Physics, University of California, Los Angeles.
2. Dr. Leo L. Beranek - - - - - - -	From Bolt, Beranek & Newman, Inc. Professor of Communication Engineering, Technical Director, Acoustical Laboratory Massachusetts Institute of Technology, Cambridge.
3. Dr. Cyril M. Harris - - - - - - -	Director, Electronics Research Laboratories, Professor of Electrical Engineering, Columbia University, New York City.
4. Dr. Arnold M. Small - - - - - - -	Chief, Reliability, Human Factors and Acoustics, Convair, San Diego, California.
5. Dr. Michael Rettinger - - - - - -	Engineering Products Division, Radio Corporation of America, Hollywood, California.
6. Dr. T. D. Northwood - - - - - - -	Building Physics Section, Division of Building Research, National Research Council, Ottawa.
7. Dr. Arnold Walter - - - - - - -	Director, Faculty of Music, University of Toronto, Professor of Music, Royal College of Music, Toronto.
8. Dr. H. LeCaine - - - - - - - -	Electronic Music Group, Radio and Electrical Engineering Division, National Research Council, Ottawa.
9. Dr. Leslie Bell - - - - - - - -	From Leslie Bell Singers, Inc., Toronto.
10. Dr. Geoffrey Waddington - - - -	Director of Music, Canadian Broadcasting Corporation, Toronto.
11. Henry Plukker - - - - - - - - -	Conductor, Calgary Philharmonic Society, Calgary.
12. Murray Adaskin - - - - - - - -	Soloist, Professor of Music, University of Saskatchewan, Saskatoon.

ACOUSTICAL ADVISORY COMMITTEE FOR TESTING AND TUNING:

1. Dr. H. Grayson-Smith - - - - -	Chairman, Head of Department of Physics, Professor of Physics, University of Alberta, Edmonton.
2. Dr. N. H. Grace - - - - - - - -	Director, Research Council of Alberta, Edmonton.
3. R. Clarke - - - - - - - - - - -	Chief Architect, Department of Public Works, Edmonton.
4. A. B. Steinbrecher - - - - - - -	Senior Project Architect, Member of Acoustical Group, Department of Public Works, Edmonton.
5. W. E. Rossman - - - - - - - - -	Architect, Head of Acoustical Group, Department of Public Works, Edmonton.

6. M. F. Fayers - - - - - - - - - - - - - - Engineer, Member of Acoustical Group, Department of Public Works, Edmonton.

7. R. S. Eaton - - - - - - - - - - - - - - - Head of Music Division, Professor of Music, University of Alberta, Edmonton.

8. H. A. Spencer - - - - - - - - - - - - - Secretary of Committee, Industrial Engineer, Research Council of Alberta, Edmonton.

9. D. M. Beaupre - - - - - - - - - - - - - In advisory capacity for electronics, Electronics Engineer, Canadian Electronics Ltd. Edmonton.

ACOUSTICAL GROUP IN CHARGE OF ACOUSTICAL DESIGN AND TEST CONCERT:

1. W. E. Rossman - - - - - - - - - - - - - Head of Acoustical Group, Test Manager.

2. Dr. T. A. Northwood - - - - - - - - - - Senior Member.

3. A. B. Steinbrecher - - - - - - - - - - - Member.

4. M. F. Fayers - - - - - - - - - - - - - - Member.

5. E. F. Stevens - - - - - - - - - - - - - - Research Officer, Building Physics Section, National Research Council, Ottawa.

6. C. E. Till - - - - - - - - - - - - - - - - Research Officer, Prairie Regional Laboratory Division of Buildings Research, National Research Council, Saskatoon.

CO-ORDINATOR OF AUDIENCE:

W. H. Kaasa - - - - - - - - - - - - - - Co-ordinator of Cultural Activities, Department of Economic Affairs, Edmonton.

PERFORMERS:

1. Augmented Edmonton Symphony Orchestra with Musicians from Calgary Philharmonic Society and harpist from Seattle.
   Total 100 musicians.
   Conductor—Lee Hepner, Edmonton.

2. Test concert singers of the University of Alberta Mixed Chorus.
   Total 142 singers.
   Conductor, R. S. Eaton, University of Alberta, Edmonton.

3. Murray Adaskin, Violin Soloist.

4. A. B. Crighton, Organist.

5. Patricia Hepner, (Mrs.), Pianist.

6. Audience, total 1,851 including singers, between them musically trained 220 people.

7. Announcer: J. T. McCreath, Department of Economic Affairs, Edmonton.

INSTRUMENTS:

1. Steinway concert grand

2. Allen two-manual electric organ (temporary installation.)

3. Stradivari

List of Personnel

CONNECTED WITH THE ADMINISTRATION, PLANNING, SUPERVISION AND CONSTRUCTION OF THE PROVINCIAL JUBILEE AUDITORIUMS, EDMONTON AND CALGARY, ALBERTA

DEPARTMENT OF PUBLIC WORKS

Hon. James Hartley,
Minister of Public Works

Hon. Alfred J. Hooke,
Minister of Public Works and Minister of Economic Affairs until August 1, 1955, now Minister of Municipal Affairs and and Provincial Secretary

Arthur Arnold,
Deputy Minister of Public Works

Stanley E. Kenworthy,
Assistant Deputy Minister

Emily Kenny, Mrs.
Secretary to the Hon. J. Hartley

Irene Gibson, Mrs.
Secretary to the Hon. A. J. Hooke

D. Cashman, Miss,
Secretary to the Deputy Minister

GENERAL OFFICE

V. C. Heim,
Co-ordinator of Works and Maintenance

G. Murray,
Accountant

K. Thomas
E. T. Hughes
A. H. MacDonald
H. McCormick
F. R. Domries, Miss
H. Smart, Mrs.

ARCHITECTURAL BRANCH

R. Clarke,
Chief Architect

H. T. Howard,
Administrative Assistant

J. F. Hunt,
Chief Engineer

D. Panar,
Consulting Mechanical Engineer

A. B. Steinbrecher,
Project Architect

G. A. Jellinek,
Senior Architect

W. E. Rossman,
Head of Acoustical Group

M. F. Fayers,
Member of Acoustical Group

C. Blakney, Miss,
Stage and Backstage, Interior Decoration and Furnishings

W. Wood
L. Torok
W. Nieman
N. Flak
L. A. Cysouw
C. H. Kamp
A. H. Preston
D. Hooke
K. Gericke
W. Tiffin
R. Gerhart
L. Chamberlin
P. H. Tuckwell
A. Dale
D. Sykes-Free
P. Hemingway
R. Hicks
F. Gorniak
P. Singleton
C. Lashbrook
C. Efstathiou
E. King
J. Klvac
E. Uhlich
H. Wunderling
D. Taunton
H. Rother
D. Jorgenson
D. Weiss
D. MacDonald

INTERIOR DECORATION

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E. Crowther, Miss

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B. Brooker,
Supervising Structural Engineer

R. G. Proudfoot,
Supervising Electrical and Mechanical Engineer

H. Neelands,
Electrical Engineer

D. Moore,
Structural Project Engineer

J. Smart
W. Strange
J. Mekechuk
D. Harris
E. G. A. Henderson
T. Kostiuk
L. Malmberg
B. Vanderboor
H. Lucas
A. Barclay
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P. Bogelund
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S. V. Mihli
H. Werhafen
E. L. Bilton
E. P. Houtschilt
B. Koning
Z. Stefanov
°A. Kanters
°H. MacDonald
°W. Droege
°R. Ferguson

°These 4 were obtained on loan from private firms for a short time.

KITCHEN EQUIPMENT

W. W. Lowrie

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A. Edinga,
Supervisor of New Construction

H. Brettelle,
Supervisor of Maintenance

J. A. Inglis,
Maintenance Supervisor, Calgary

A. R. Henkleman,
Maintenance Supervisor, Edmonton

C. Paul,
Supervisor, Calgary

S. Ramsey,
Electrical Supervisor

L. Gregory,
Plumbing Supervisor

A. Schuck,
Tin Shop Supervisor

J. Longmore,
Supervisor of Painting and Decorating

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Edmonton Auditorium

G. Brubaker,
Calgary Auditorium

R. Wilson,
Plan Checker, Edmonton Auditorium

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Administrative Assistant

J. McMahon,
Engineer

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Director of Services

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Chief Factory Inspector

ELECTRICAL PROTECTION BRANCH

I. C. Finlay,
Chief Electrical Inspector

DEPARTMENT OF ECONOMIC AFFAIRS

Hon. A. Russell Patrick,
Minister of Economic Affairs from August 2, 1955
Ralph R. Moore,
Deputy Minister of Economic Affairs
W. H. Kaasa,
Co-Ordinator of Cultural Activities
Blake MacKenzie,
Co-Ordinator of Cultural Activities during initial stage of Auditorium planning, now Public Relations Officer with the Department of Municipal Affairs
E. S. J. Bryant,
Director of Advertising
H. Martin,
Director of Publications
R. D. McLean,
Public Relations Officer
J. E. Plewes,
Director of Auditoriums
J. T. McCreath,
Supervisor of Drama and Music
H. A. Webster,
Southern Area Supervisor
J. L. Patterson,
Secretary-Accountant and Personnel Officer
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Film Commissioner
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Photographic Branch
R. Albert,
Photographic Branch
W. Jones,
Photographic Branch
W. D. Marsden,
Photographic Branch

List of Construction Companies

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S. Campbell
S. Stains
A. Macklin
J. A. Webb
P. Epp Jr.
R. H. Green
R. Brodner

Edmonton

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Abboud, M.
Achtemichuk, W.
Airey, R.
Allan, J.
Allison, T.
Anderson, G.
Anderson, L.
Anderson, O.
Andrews, P.
Audy, G.
Audy, T.
Balch, R.
Barth, R.
Basaraba, O.
Bass, J.
Batt, A.
Baumgaertner, F.
Bavato, T.
Beatty, R.
Belanger, C.
Belzenowski, E.
Bender, W.
Bennett, E. M.
Bennett, R.
Bentowski, L.
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Berger, C.
Bidlock, G.
Bimman, K.
Blue, G.
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Bossert, C.
Bottcher, E.
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Bowlen, K.
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Brieda, V.
Brock, H.
Broderick, P.
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Burma, S.

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Carlson, W.
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Cherivatin, Z.
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Civideno, M.
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Colborne, C.
Cole, A.
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Daniels, J.
Daquis, E.
Darda, J.
Darda, M.
David, J.
David, R.
Davies, A.
Davis, J.
Deacon, J.
Denther, R.
Devine, E.
Dittmer, L.
Dixon, R.
Dolling, P.
Draeshner, R.
Dreger, E.
Dreger, F.
Dreger, W.
Dunault, E.
Duncan, H.
Duncan, R.

Earl, N.
Eckert, H.
Ehnes, A.
Ellestead, K.
Epton, R.
Erhardt, A.
Ernst, K.
Ertman, F.

Fallow, A.
Fayant, J.
Ferris, W. D.
Festerer, F.
Flemke, F.
Flode, B.
Footz, F.
Foulds, A.
Frank, G.
Frank, P.
Frederick, J.
Frederick, E.
Frocklick, H.
Frome, H.
Fuchs, W.

Geldoff, W.
Gerlinski, A.
Glover, M.
Gogowich, S.
Goldsmith, G.
Gonsabres, R.
Goodwin, J.
Gordey, G.
Gordon, A.
Gordon, J.
Gosche, L.
Gostovich, D.
Goupuwich, F.
Grace, M.
Grammar, D.
Greening, P.
Grieb, A.
Griffin, W.
Grothen, T.
Gullison, R.

Hallet, N.
Hamel, G.
Hankin, D.
Hanson, W.
Harrick, R.
Harris, L.
Hartman, J.
Heaton, P.
Hellerud, A.
Henderson, D.
Henderson, J.
Hildebrandt, W.
Hiller, A.
Hiller, E.
Hirst, L.
Hodge, G.
Holland, H.
Holowicki, J.
Horbul, J.
Hore, A.
Hovat, P.
Hughes, R.
Huley, J.
Hull, A.
Hull, R.
Humphrey, J.
Hyder, E.

Inkster, J.
Irving, G.
Ives, F.
Ives, W.

Jarema, P.
Jensen, K.
Jeske, E.
Johnson, J.
Johnson, K.
Johnson, T.
Jorgensen, M.
Jurieka, M.

Kalkay, E.
Karbonic, A.
Karpyshnyn, V.
Kasper, F.
Kasprphym, P.
Kelly, L.
Kemp, A.
Ketchum, V.
Kettleson, T.
King, R.
Klatt, A.
Klebig, K.
Knatowski, E.
Knudsen, J.
Knusen, A.
Kooistra, A.
Kosowan, R.
Kostrub, F.
Kostrub, G.
Kostrub, M.
Krewuisik, J.
Krill, N.
Kruse, R.
Kryka, K.
Kudima, C.
Kuhl, H.
Kunsel, E.
Kuz, M.

Labiuk, P.
Lange, H.
Langley, D.
Lapozar, J.
Leman, A.
Lemay, A.
Lemieuz, A.
Lenley, F.
Lenzki, G.
Lettinger, H.
Linko, J.
Litke, W.
Littlechild, K.
Littlechilds, S.
Lobas, J.
Loeb, H.
Loeffler, J.
Lucas, G.
Lutz, L.

Macarowski, F.
MacClean, A.
Maciborsky, J.
Mady, E.
Mahruri, H.
Marcenko, T.
Martin, W.
Martiniuk, J.
Matia, B.
McClean, J.
McKnight, B. J.
McLeod, B. A.
McLeod, K. F.
McTavish, C.
Meier, M.
Mellot, J.
Melnechuk, A.

Merskey, H. E.
Mikarko, E.
Miller, J.
Mitchell, J.
Money, J. S.
Monoghan, J.
Moore, W.
Morgan, E.
Morocco, G.
Morrison, R.
Mortensen, S.
Mullen, C.
Mulleneff, H.

Nauen, G.
Nebo, L.
Nehruri, T.
Nemeti, S.
Neumann, D.
Newcombe, L.
Newman, F.
Nishol, J.
Normand, A.
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